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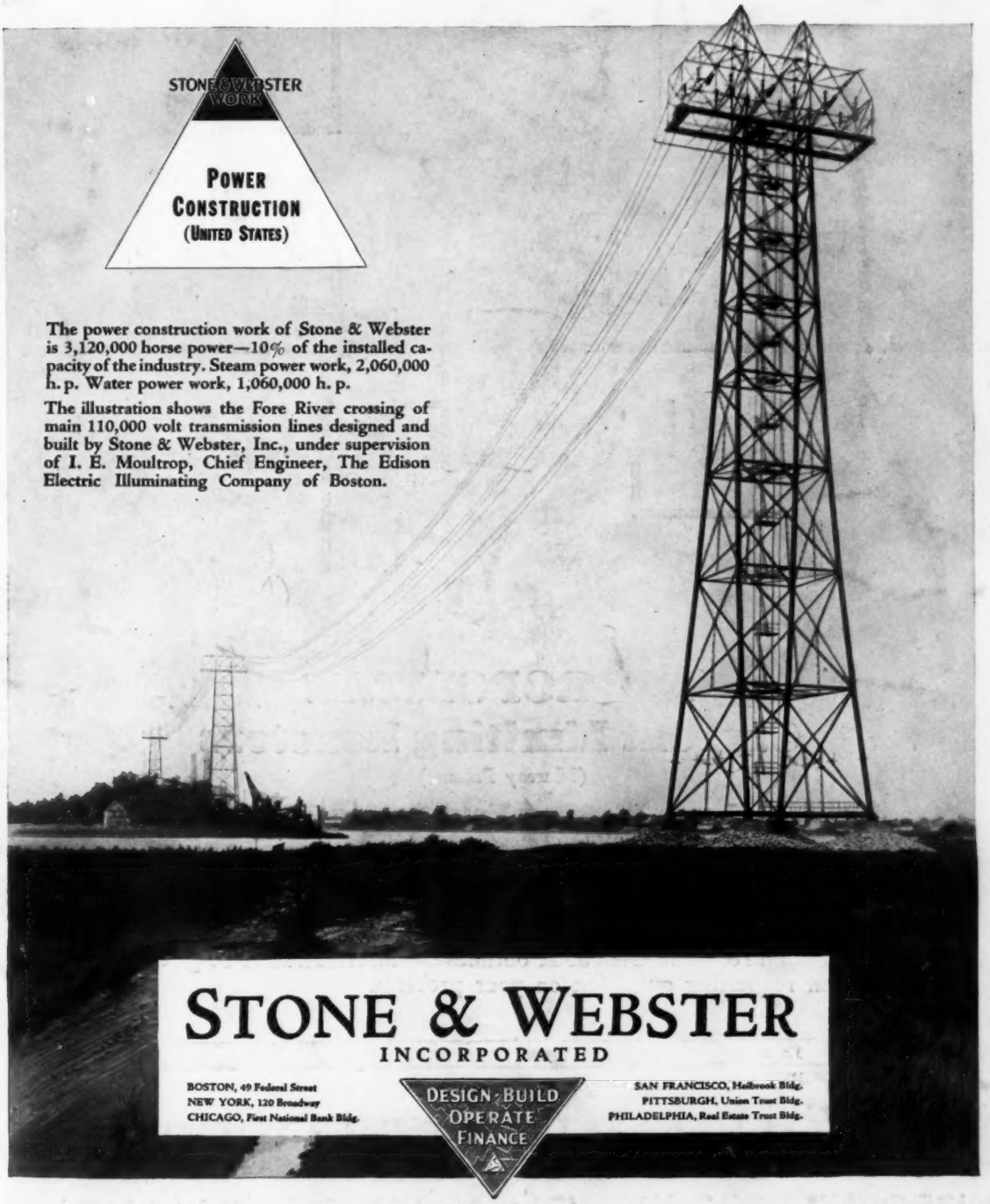

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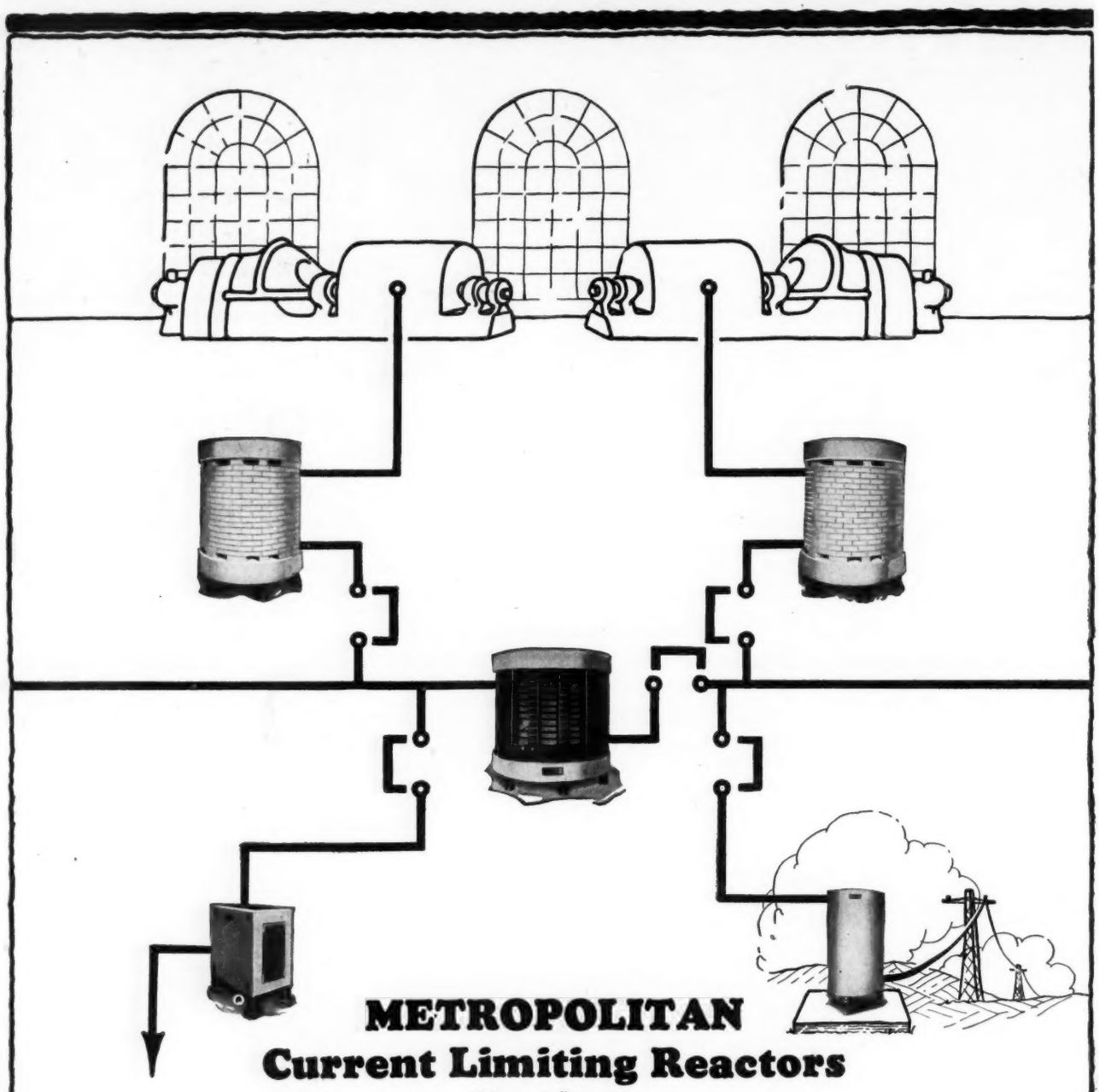

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W. H. ONKEN, JR.
Editor

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Inertia Delays the Diffusion of Utility Bonds

SLOW but certain progress is being made in the direction of wider acceptance of first-class public utility obligations by savings banks and trust funds. The current economic bulletin of the National City Bank of New York points out that recent transactions indicate that the old 5 per cent yield "resistance point" is rapidly disappearing and that investors are developing a willingness to accept a return on better-grade utility issues comparable with the return on rails and municipals. Inertia in changing existing laws is probably in the main responsible for the delay of many states in expanding their statutes to include well-selected utility bonds in permissible savings bank and trust fund outlets, rather than any feeling of uncertainty as to the merits of the public utility group. This inertia has the dual effect of depriving the utility industry of the benefits of large surplus funds seeking employment in safe and attractive fields and of creating artificial values for the limited legal list, which in turn impair the earning power of savings banks and trust funds in many states. The importance of concerted and sustained efforts to remedy these conditions on the part of those responsible for the upbuilding and financing of the public utility industry is apparent.

* * * *

Shrinking Profits of Electrical Manufacturers

MANUFACTURERS of electrical apparatus not only in this country but also abroad complain that, while orders are plentiful enough, competition for business is so keen and ruthless that quoted prices yield very little profit. Competition of this sort is suicidal, and "there is something rotten in the state of Denmark" when such conditions persist.

Of course, there are manufacturers to whom the only road to profit is labeled "increased prices," and there is no gainsaying that that is a simple and effective way. There are others, however, more far-seeing, who know that there are other ways of making gains, such as, for example, greater efficiency in production and marketing or increased production through price differentials. Electric light and power executives know full well the difference between profitable and unprofitable business and how the first encourages and the second discourages all initiative and enterprise. When, therefore, manufacturers have done all that is possible in the way of reducing production costs, it is penny-wise and pound-foolish to permit purchasing agents to squeeze out the last cent of profit. Temporarily a saving may result, but eventually the goose that lays the golden eggs dies from lack of nutrition. If research, science and engineering are to be applied to manufacture and the art thereby enhanced, the product must bring a price to cover those costs and leave a margin for refinements and betterments as well as profit. The reasonableness of such a plea should commend itself particularly to electric light and power company executives.

* * * *

Say It with Dividends

A MARKED tendency to discuss company and industry problems in brief printed messages accompanying quarterly dividends is gratifying to believers in utilizing every proper channel of popular enlightenment on the great issues of the hour in the electric service field. The practice may well become general in the face of political assaults upon the electrical industry now in preparation in certain congressional quarters. It is well to emphasize the dangers of government-ownership propaganda before regional conventions of the light and power companies and to acquaint employees with the fallacies and possible peril to American institutions that inhere in schemes to allow the government to enter the power business even on a small scale and in the guise of public improvements; but if the industry stops with its own people, woe will betide it. Financiers, executives and leaders of electrical men and women throughout the country should give immediate and serious thought to the importance of doing everything within reason during the coming winter to give the ultimate arbiters of their fate—the public at large—the truth about this industry of surpassing service and inspire them to combat all movements that strike at American ideals of industry and business.

* * * *

Serving Beyond the Economic Limit

A SURVEY appearing in this issue and covering a study of the industrial structure of several American cities indicates that there is room for the electrical manufacturer to improve his present industrial distribution methods. Of the industrial units in a typical city, it was found that 92½ per cent should and could be served most economically by the electrical contractor in the territory. The remaining 7½ per cent, representing a high percentage of the total volume of business, covers the group where direct selling is an advantage.

Where purchase requirements are very small, as in this large group of 92½ per cent of the industrial units in a city, the manufacturer in selling direct to the consumer is performing a service entirely beyond his economic limitation. The cost of doing business with such scattered small buyers is out of proportion to the total costs, although too often the manufacturer is unaware of this because he has not allocated his costs to different

classes of business. In serving this group the manufacturer takes on a distribution job. He is called upon to render more service to this small buyer, but the price of his goods remains the same. Hand-to-mouth buying as a permanent factor of our industrial life aggravates this condition, and it seems certain that with the added distribution load on the manufacturer the benefits of volume production can easily be eliminated. The small-order nuisance is recognized in every branch of industry, yet the way is open to remedy it. The small order is justified only where it is a service to a desirable customer whose purchases ordinarily are large enough to be attractive business.

These facts appear to indicate that the manufacturer is faced with the problem of adjusting his sales methods and selling organization to sell directly to one group, while he should encourage the development of local outlets to care for the other group. This would combine his efforts to accomplish a more efficient selling job and leave the question of distribution and individual service to those equipped to handle it.

* * * *

Shall Central-Station Companies Buy Industrial Power?

CONSIDERABLE difference of opinion exists among central-station managers today in regard to the desirability of purchasing power from time to time from the generating plants of their industrial customers. One school of thought advocates the policy of supplying energy wherever possible to industries on a one-way basis only; the other believes in providing for interchange when economical from the standpoint of the utility or when necessitated by emergencies in operation. Managers who work along the lines of the former program often characterize the latter as very bad salesmanship, and conversely, executives who believe in profitable give and take tend to class the unidirectional leaders as mistaken.

Stripping this problem of elements capable of stirring up prejudices, it would seem that in the last analysis it is a purely engineering and operating question and should be decided as such after careful investigation in each specific case. One cannot escape the fact that in the long run the industrial world will seek to obtain power at the lowest attainable cost consistent with reliable service. This cost must be expressed in money plus other factors having weight in the purchaser's decision. There is no need to list these at length, but convenience is one of the most important. In some cases the local heat balance will defer the purchase of energy for years, perhaps indefinitely. Per contra, many other instances will arise where central-station energy is the obvious and immediate solution. Between these numerous examples will occur where a combination of locally generated and purchased power appears best, but this can be true only in situations which enable mutually satisfactory agreements to be worked out by each party. Such satisfaction means that the utility company must be able to buy power from the industrial plant at a price commensurate with its value to the former under the prevailing conditions, that the power is of suitable characteristics at the time when it can be absorbed, and that the industrial plant receives an acceptable consideration for the delivery of kilowatt-hours which it finds advantageous to produce and thus dispose of.

There is no categorical answer to the question in our heading, but it is hard to see why a negative reply should ever be allowed to be made as a matter of customer psychology. If the conditions warrant interchange as an economic proposition without detriment to service quality, the mere fact that the utility manager believes that all the power service of his territory should be furnished by the central-station system ought not to bar an interconnection agreement which is workable and mutually satisfactory.

One of the important power systems of the Northeast owes no small part of its initial progress to skillfully drawn reciprocal power contracts with industries which began to take its service under conditions imposing standards far from the present-day requirements of reliability. As the system grew and as its own plants multiplied in number and rating, the relative importance of the customers' plants decreased; but there is good reason to believe that the entrée gained through these industrial tie-ins has always been worth while. We believe that as time passes the policy of seeking the most economical all-around solution of every industrial power problem, whether by combination or independence of plant resources, will prevail over the timorous one of avoiding an interchange agreement as a commercial pestilence. Where the conditions are favorable, is it not better to inoculate the patient with even a small injection of the healthful virus of central-station power than to seek to cure him through the alternatives of starvation or overdose?

* * * *

The Wiring Problem and the Experience of the Plumber

A BROAD movement to bring about the adequate wiring and the refixturing of homes is very definitely taking shape in the industry. In Chicago, in Cleveland and in other cities local campaigns are either under way or being organized to do this rewiring job and modernize domestic lighting. The much-discussed joint industry sales conference is about to come together at the call of the reorganized Society for Electrical Development to formulate an embracive national program. It all points to one end. The electrical industry is at last going to get down to business and spend some real money to build a basic structure around which the use of complete equipment in the home may be developed.

But when the industry undertakes to make adequate the wiring of sixteen million homes it comes face to face with the long-evaded problem of the contractor. For there are thirty thousand contractors, virtually all of whom save the twenty-three hundred electragists belong to no association and have no guiding relationship with the organized industry, each operating "on his own," by the destructive process of price competition. What shall be done to put the contractor upon his feet economically? Could anything better be done than to follow the lead of the successful experience of the plumbing industry?

Twelve years ago the Master Plumbers' Association had but a few hundred members. There were thirty thousand plumbers. The manufacturers and wholesalers of plumbing supplies decided that something had to be done to build up a national consciousness among the plumbers and establish some uniformity in policy and practice. So they organized a National Trade Extension

Bureau in Evansville, Ind., separate from the trade association. This bureau went to work to teach the plumbers better estimating, better cost keeping, better business methods generally, just as the Association of Electragists is working today in a limited way to help our contractors. The plumbers' bureau has extended its work and grown until today it employs sixty men in the field and in headquarters, and in the past twelve years it has fed fifteen thousand members into the Master Plumbers' Association. Therefore, roughly, half the industry is now joined together in national work and susceptible to stimulation, guidance and direction to industry purposes. Today the Master Plumbers' Association contributes $60,000 a year to the work of the extension bureau, and the bureau is working to a five-year program with a three-million-dollar budget. It is worthy of note that the white-tiled, porcelain-equipped bathroom has within recent memory become the standard of the American home.

The electrical industry is dependent upon electrical contractors to do its wiring. It cannot hope to get ahead very fast while nearly twenty-eight hundred of the contractors are working "lone wolf." They must be brought into co-ordination and harmony with industry programs and purposes. Could the industry do better than to capitalize the experience of the plumbers? The coming industry sales conference should give to this thought very serious consideration.

* * * *

Why Correct Power Factors?

IT SEEMS almost unquestionable that if you want to get some one to do something for you there are but three possible ways of achieving the purpose. You may use force or coercive persuasion. You may use honeyed and beguiling words. You may make it worth while for him to meet your wishes. In power-factor rectification, or any other utility plan, coercion is not to be contemplated. Persuasion has worked wonders which tax credulity. There has been little endeavor to make it worth while in the dollars-and-cents way, yet the subject admits of co-operative solution most readily. If a utility company can reduce uncompensated-for losses by bringing about a rectified power factor at the industrial plant, it should be recognized that some inducement other than a promise of better operating conditions within the mill should be made. Such an installation by the manufacturer may lead to operating economies of no small proportions, but there is an equitable adjustment that may well be involved.

An arrangement of this nature has been effected in too few instances. A large Eastern plaster-products mill, formerly operating at an average power factor of 65 per cent, was offered an inducement by the supplying utility in the form of a rebate of 3 mills a kilowatt-hour on the charge for energy if it would maintain an average power factor within 5 per cent of unity. Capacitors have been placed at strategic points in the several buildings of this plant, and they are added to or removed from the line as conditions require. A monthly rebate of $3,000 has been received since the installation was completed, and a return in the form of rebates of nearly 60 per cent is received annually on the capital invested. Operating conditions have improved, and expenditures for additional conductor, transformer, breaker and accessory equipments have been rendered unnecessary. The utility company has profited by the improved conditions.

The rectification of power factors should not be viewed altruistically as a good deed for one's fellow consumers nor as a favor to power companies, but as a relatively uninvolved problem in dollars and cents. Not every industrial plant has full induction-motor equipment with an accompanying 65 per cent power factor. Few use 1,000,000 kw.-hr. a month, but the lesson is clear for power companies and customers alike. It must be made worth while for the customer to install corrective equipment.

* * * *

The Lantern on the Plow

ELECTRIC light and power companies have progressed from a relatively simple load structure to an aggregate complexity of useful energy-consuming devices. Each successive development has added to the consumption by the mythical average customer and increased the total output.

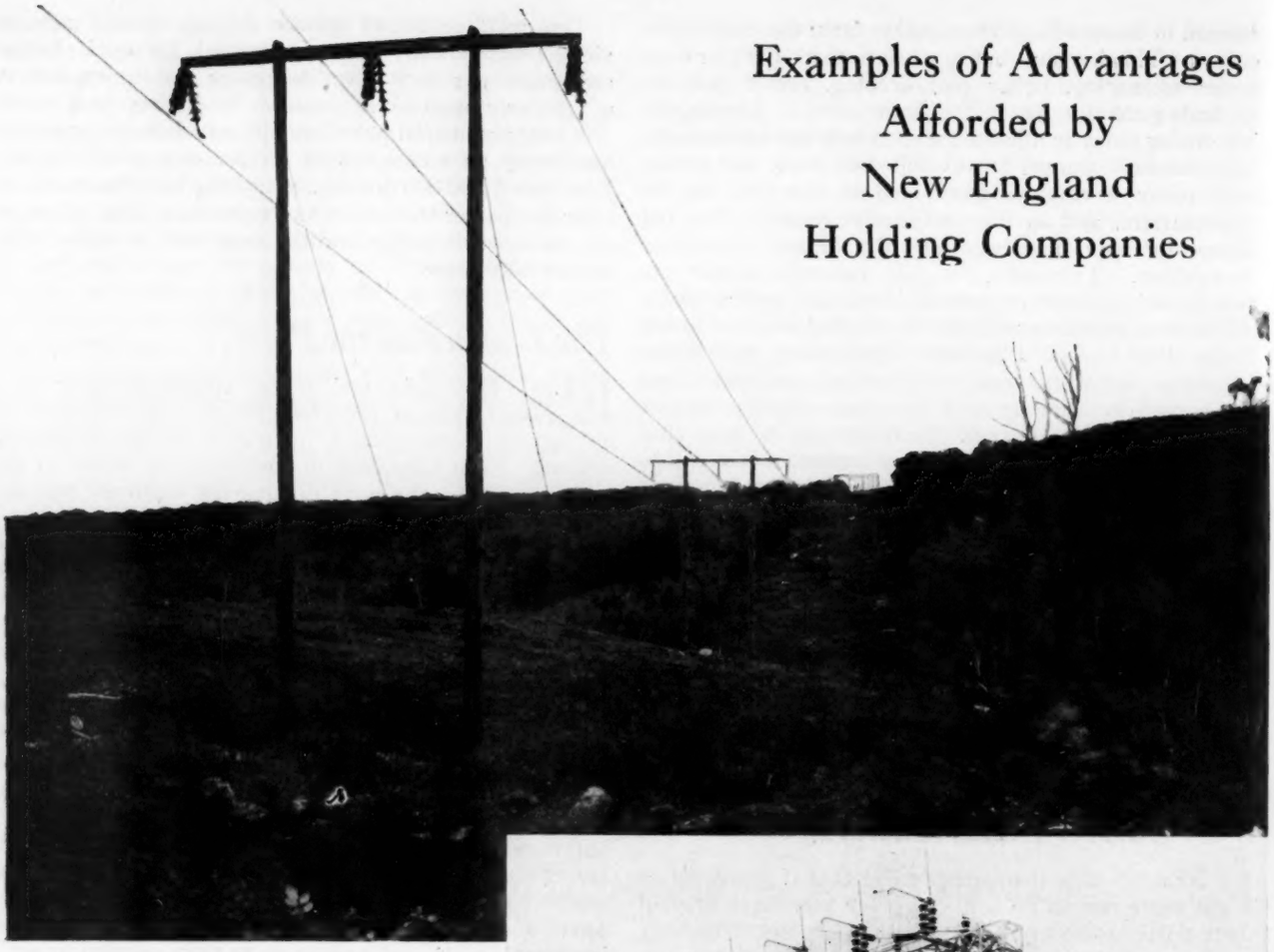
Service to and for farmers has long been a debatable topic in regard to the economy of line extensions. The basic thought has been that the comfort, economy and utility of electric service must attract this class of consumer eventually. It may soon develop that the agriculturist must of necessity have electricity on his farm and that the utility will go to undreamed-of lengths to give it to him. There is a mutuality of interest involved.

Reports and surveys by official bureaus and research by trained observers indicate that as a race we are losing our fight against the insect world for the retention of our food supply. The farmer is waging a losing battle. He cannot fight it out alone, indefinitely. The various insects which feed and multiply upon our fruit, vegetable, cereal and fibrous supplies are apparently developing an inherited immunized resistance to our common insecticides and poisons. The government has encouraged and aided in the dusting of our orchards and fields with chemical impalpables, and gases have been released to effect the same end. Old methods fall far short of producing reasonable satisfaction. In his address before the Empire State Gas and Electric Association last week Prof. P. J. Parrott related the failure of seventeen successive applications of arsenical compounds to retard the spread of insects on one crop in Arkansas. The harvest was lost in two different years in spite of treatments of an intensity several times the customary amount.

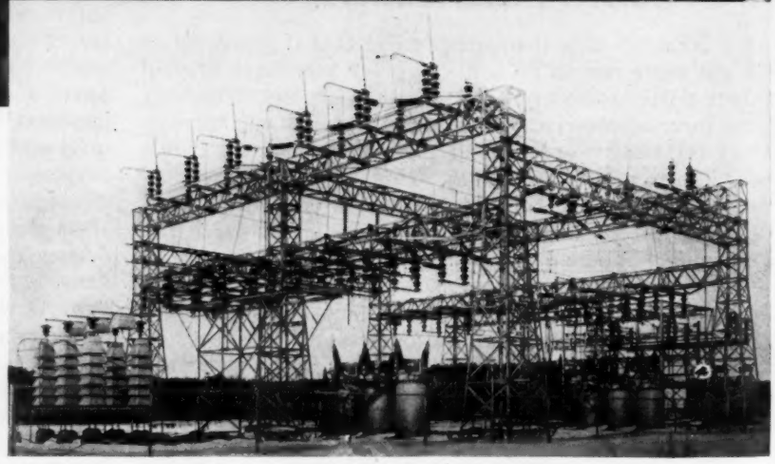
New agents, new methods, new concentration of effort and thought are needed to combat the danger that has been growing with the years. Can we attract our insect foes to traps by sound, light or odor? Can we destroy them by current, heat or imprisonment? Electricity may offer a solution to the problem. Experimental work with light traps using colored lamps of different wattages has shown that some of the pests may be trapped in this way. Light bordering on the ultra-violet appears to offer a maximum of attractive power. Destructive electric currents have also been employed. Electric treatment of the soil has been undertaken in conjunction with plowing operations.

If fruit growers, truck farmers and other agriculturists can be brought to use but one 100-watt bulb to each acre of cultivated area and to use that throughout each summer night, an amazingly vast potential market will open up. The possibilities are almost limitless. The battle must be won. All must join forces against a common, tireless, merciless, inconceivably numerous enemy. It may also prove highly profitable to assume this duty.

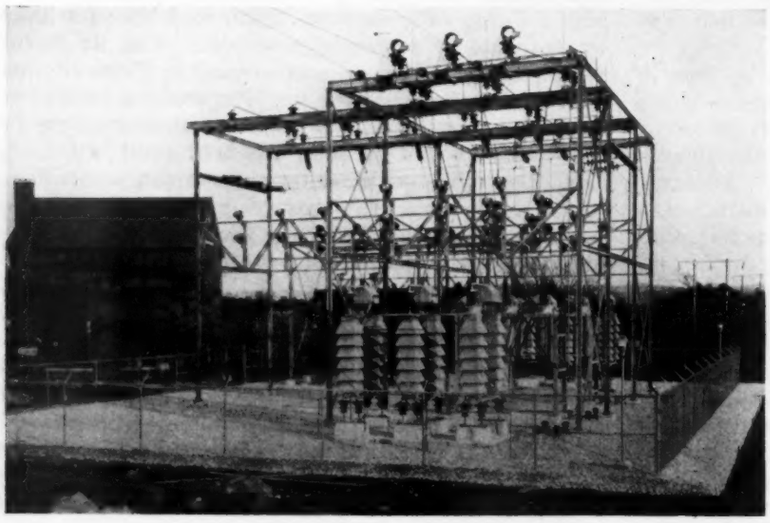
Examples of Advantages Afforded by New England Holding Companies



SECTION of Keene-Manchester-Dover transmission line, connecting properties of Public Service Company of New Hampshire. When surplus hydro-electric power exportation is legalized by Maine it will interconnect major properties of New England Public Service Company and permit economical interchange of energy between diversified watersheds in four states through further connections with other power companies. The line is 86 miles long, is designed for 110 kv., but operates at 66 kv., and cost slightly more than half a million dollars. The financing would have been extremely difficult without holding company credit.



GREGGS FALLS substation of the Public Service Company of New Hampshire, near Manchester, is an excellent example of high-grade design and construction carried out by subsidiary property engineers in collaboration with holding company advisory staffs.

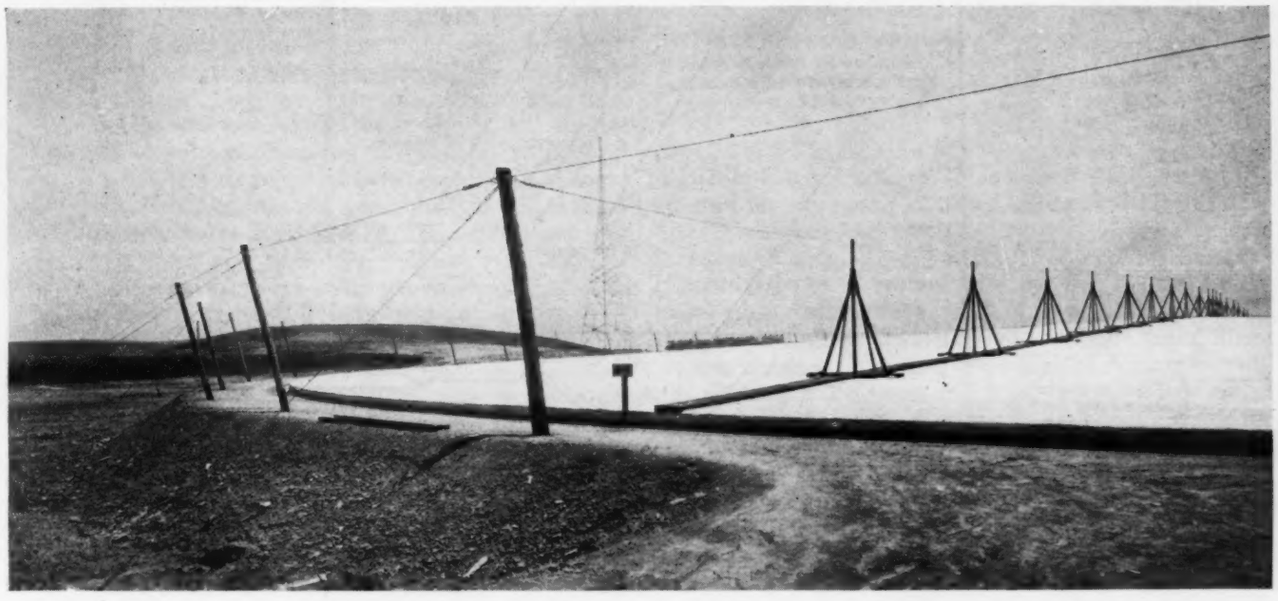


JACKMAN hydro-electric plant and outdoor substation of the Public Service Company of New Hampshire, through recently financed and constructed interconnections, are tied into the northern New England trunk system of the parent company — the New England Public Service Company. This arrangement enables advantage to be taken of diversity of river flows in handling widely separated loads.

Lightning Protection for Oil Reservoirs

By J. T. LUSIGNAN, JR.
Leland Stanford, Jr., University

VIEWS of leading authorities and experiments discussed to show existing theories of lightning and lightning protection. Protective systems described. Field tests to be made



METHOD OF SUPPORTING WIRE NETWORK OVER OIL STORAGE RESERVOIR

SINCE the disastrous oil fires in California of 1926, entailing millions of dollars of loss, the attention of electrical engineers and oil company officials has been forcibly turned to means of protecting large storage reservoirs from lightning. The need for some form of protection against lightning was recognized several years prior to these fires, and as early as 1923 the Standard Oil Company had the matter up with prominent research engineers and at the time of the Union Oil Company's fire in April, 1926, the Shell Company of California actually had a lightning protective system under installation.

Before discussing protective systems actually installed and the theories upon which they are based, it is well to review present knowledge on the subject of lightning as contributed by leading authorities on this highly important phenomenon.

NATURE OF LIGHTNING

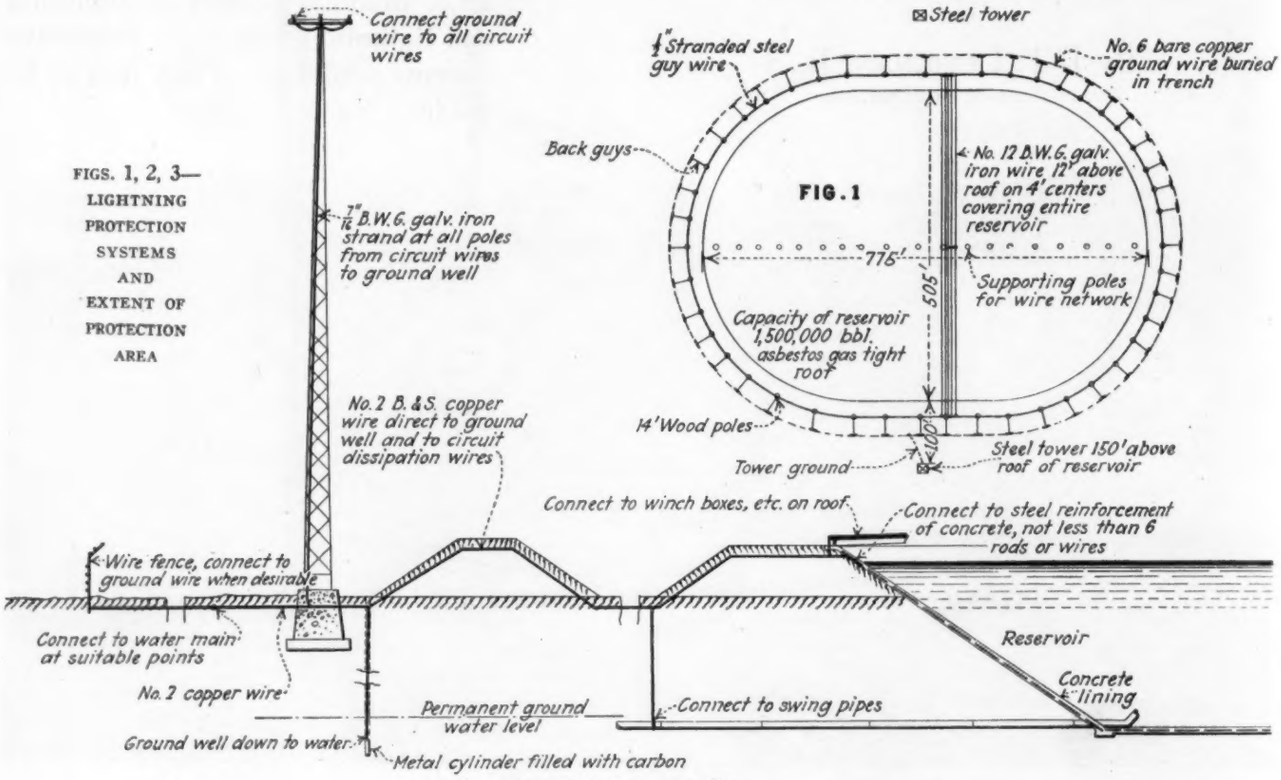
One understanding of the nature of the charge in a thunder cloud from which the lightning discharge results and the manner in which this charge builds up has been largely due to the early work of Dr. G. C. Simpson (*Proceedings* Royal Society A-82, 1909; A-83, 1910). From his studies he has developed the theory that upward currents of air of sufficient velocity (greater than 8 meters a second) break up the water drops of the cloud into positive and negative particles. The latter are carried on up into the upper portion of the cloud by the ascending air, thereby charging it negatively. This separation of charges thus leaves the lower region positive and causes a potential to be built up between the two portions of the cloud. When these cloud potentials are of sufficient magnitude, breakdown, in the form of lightning strokes, occurs. These strokes may take place within a cloud, between clouds and occasionally, but with much less frequency, to earth.

ANALYSES OF WAVE FORMS

Dr. H. Norinder of Upsala University, Sweden, has made extensive measurements of the field gradients beneath a cloud, and also of the electrical nature of the lightning flash itself. He has been largely responsible for the generally accepted theory that the stroke is always of unidirectional nature and not oscillatory (ELECTRICAL WORLD, Feb. 2, 1924).. In addition his measurements have indicated that the wave front of the discharge is slanting rather than steep. These measurements were made by means of a cathode-ray oscillograph connected to a short aperiodically damped antenna. All changes in the electrostatic field of the cloud, which at the instant of cloud discharge by lightning would be indicative of the nature of the stroke itself, could thereby be recorded.

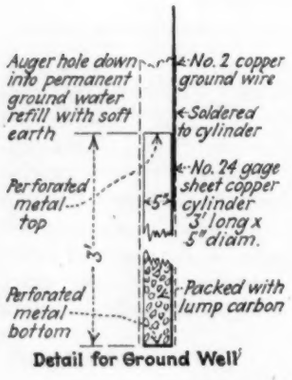
Several theories have been published to explain the manner of formation of the lightning bolt itself and the nature of its path. Simpson has recently developed one that differentiates distinctly between the stroke from a positive and that from a negative cloud and in that way attempts to account for the different shapes taken by the strokes photographed (*Proceedings* Royal Society, May 1, 1926). A. Matthias gives another theory based on the through the existence of free ions in the atmosphere, probably originally created by radioactive matter. The magnitude of power and brevity of time involved in the ultimate lightning stroke, though, are such that they cannot be accounted for through pure ionization by collision alone, hence other activating sources must be looked for. The first of these is thought probably to originate from the excitation of neutral atoms, an action

FIGS. 1, 2, 3—LIGHTNING PROTECTION SYSTEMS AND EXTENT OF PROTECTION AREA


Steel tower
Connect ground wire to all circuit wires
1/4" Stranded steel guy wire
No. 6 bare copper ground wire buried in trench
Back guys
No. 12 B.W.G. galv. iron wire 12' above roof on 4' centers covering entire reservoir
FIG. 1
7/16" B.W.G. galv. iron strand at all poles from circuit wires to ground well
775'
505'
Supporting poles for wire network
Capacity of reservoir 1,500,000 bbl. asbestos gas tight roof
No. 2 B. & S. copper wire direct to ground well and to circuit dissipation wires
14' Wood poles
100'
Steel tower 150' above roof of reservoir
Tower ground
Connect to winch boxes, etc. on roof
Connect to steel reinforcement of concrete, not less than 6 rods or wires
Wire fence, connect to ground wire when desirable
Reservoir
Connect to water main at suitable points
Concrete lining
No. 2 copper wire
Permanent ground water level
Connect to swing pipes
Ground well down to water
Metal cylinder filled with carbon

Typical Ground Wire Connection

FIG. 2


Auger hole down into permanent ground water refill with soft earth
No. 2 copper ground wire
Soldered to cylinder
No. 24 gage sheet copper cylinder 3' long x 5" diam.
5"
3'
Perforated metal top
Perforated metal bottom
Packed with lump carbon

Detail for Ground Well

Fig. 1—Details of tower and net lightning system used by several California oil companies.

Fig. 2—Method of applying Cage system of lightning protection to oil storage reservoirs.

Fig. 3—Protection of areas from direct lightning strokes (Peek). Curves show relation between R_P (ratio of radius to rod height), or protective ratio, and R_C (ratio of cloud height to rod height).

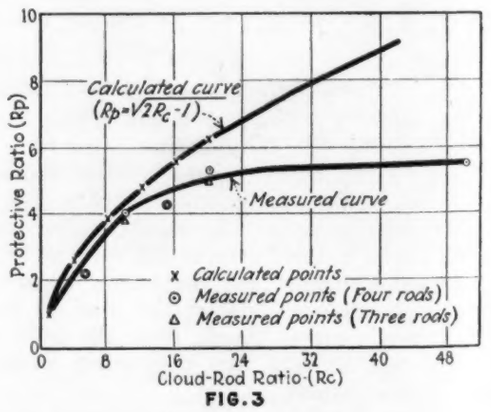


FIG. 3

work of Dr. Norinder (*Elektrotechnische Zeitschrift*, Vol. 46, pages 863-880, June, 1925).

A recent explanation of the formation of a stroke and one in which Dr. Ryan (Stanford University) feels there are great possibilities has been suggested by Marcel Lissman, graduate fellow in electrical engineering at Stanford. In this theory the stroke is first initiated as several others have assumed—namely, that through the action of the wind a sufficient concentration of charged water particles is brought about at a point in the cloud to create a potential with the necessary critical gradient to cause local breakdown. This breakdown is due to ionization by collision, the initial action being made possible as originally encountered by Prof. R. Whiddington (*Nature*, Vol. 116, page, 506, Oct. 3, 1925).

Among mixed ions formed by collision recombination is active. In such recombinations invisible electromagnetic waves are developed that distort or "excite" surrounding atoms, causing them to become ionized copiously at lower electrical intensities. This ionization thus enhances the conduction and heating, so as to lead to the final stage of intense ionization of atoms by their thermal dissociation. Such a step develops fully the pyro-electric effects in gases (see works of Jolibois, Lefebvre and Montague, *Comptes rendus*, Vol. 181, 1925; Vol. 182, 1926; Vol. 183, 1926, also Steinmetz on pyro-

electric effects) that have long been understood when occurring in such dielectrics as glass and porcelain and in such conductors as carbon, which have a negative temperature coefficient.

These two actions of excitation of atoms and thermal agitation within the current channel serve to augment the electrical breakdown of the atmosphere from that of a local nature at the concentration point of the cloud charge to one of filamentary nature with high conductivity properties. The electric field of the cloud acting on this filamentary channel of current will cause a shift of the ions superimposed upon their thermal agitation, which is equivalent to a large current flow. In the aggregate this would cause an excess of ions of one sign at each end of the channel, due to the unidirectional nature of the field. This merely calls for a shift of ions and not a rapid flow of ions or electrons over the whole length of the channel, which would necessitate assuming their having excessive velocities. The intensity of the field would greatly decrease along the channel, due to the small drop in voltage necessary to maintain the flow of ions. Accordingly there would be a building up of voltages at the ends where the concentration of charges would be, which, in turn, would cause the gradients there to approach critical values. When this occurs, a new breakdown takes place and a new channel is started from this point. This will follow one of the lines of force of the field which terminates at the end of the original channel where the concentration of charge existed. Accordingly, it might not continue in the same direction as its predecessor, but may head off at an angle, thus accounting for the variable course of a lightning stroke.

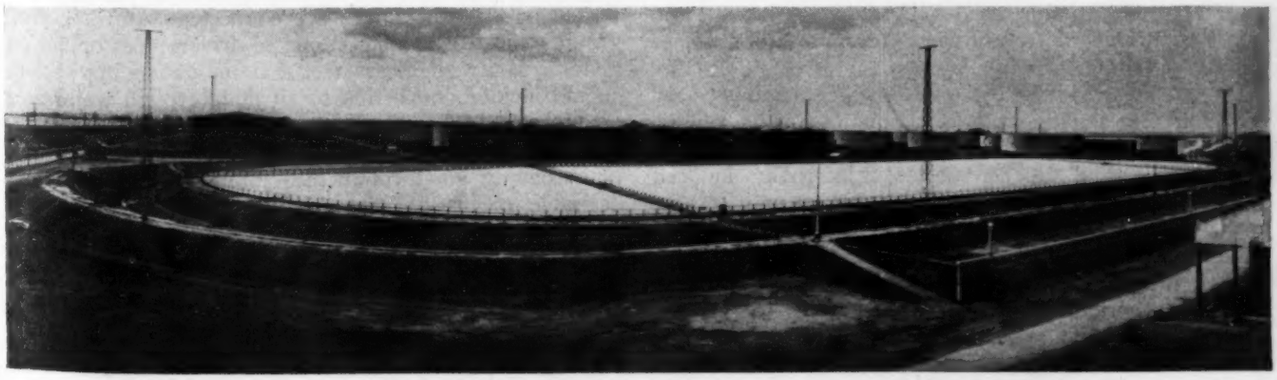
This intermittent process of building up succeeding conducting channels proceeds until the field terminating at the end of the last channel is insufficient to bring about further breakdown. At this point the continuous path thus formed will serve to discharge two portions of the same cloud, two clouds of opposite polarity or a single charged cloud, to ground. At the head of origin of the stroke there will be a branching out process discharging various portions of the cloud, thus supplying the path of the stroke with a series of unidirectional pulses. The faint branches of lightning discharges as often seen on photographs of strokes are believed to be arrested charges—that is, they have been started during the brief existence of a critical gradient, only to be quenched by the drop in voltage brought about by the rapid building up of the main filamentary channel of the stroke.

In view of his early work in lightning studies, particularly in regard to transmission lines, F. W. Peek, Jr., was able to lend his advice and assistance to the oil companies, and in this connection, therefore, he has made an elaborate series of laboratory lightning tests with model oil reservoir layouts, from which he has established recommendations in the way of protective systems (*A.I.E.E. Journal*, December, 1926, page 1246). In these he has recognized the danger arising from induced voltages as well as from direct strokes, since in the storage of oil there are often explosive mixtures present, which internal sparks between isolated metal parts would readily ignite. To take care of both hazards completely he has recommended the use of all-metal tanks, the metal of which must be sufficiently thick to provide ample conduction of currents from direct strokes and in good contact at all points to prevent sparking. Where the storage unit is particularly large and it is not practical to have it of metal, Peek recommends the use of conducting poles or towers as lightning rods to receive the direct strokes, in combination with a well-bonded metal roof to prevent internally induced voltages. As an alternative to a solid metal roof, should the latter not be feasible, he advocates the use of a wire net or cage over the reservoir, although the reliability in eliminating induced voltages is somewhat lessened, unless the mesh or wire separation is very small. Although from theory it would seem preferable to have the net well above the roof, Peek has found from tests that the height does not make a great deal of difference. He therefore feels that the most economical move would probably be to place the net directly upon the roof. In order to eliminate sparking he advocates connecting all near-by metal objects to the net.

CORDON OF BARBED WIRES USED FOR DISSIPATING CHARGE BETWEEN CLOUD AND EARTH TO PREVENT OCCURRENCE OF LIGHTNING STROKE

As an added protection against secondary discharges igniting inflammable gases many of the oil companies replace the air in the space above the oil with an inert gas.

Peek feels that only the towers or poles should be



CAGE SYSTEM OF LIGHTNING PROTECTION USED BY THE PAN-AMERICAN PETROLEUM COMPANY AT WATSON, CAL.

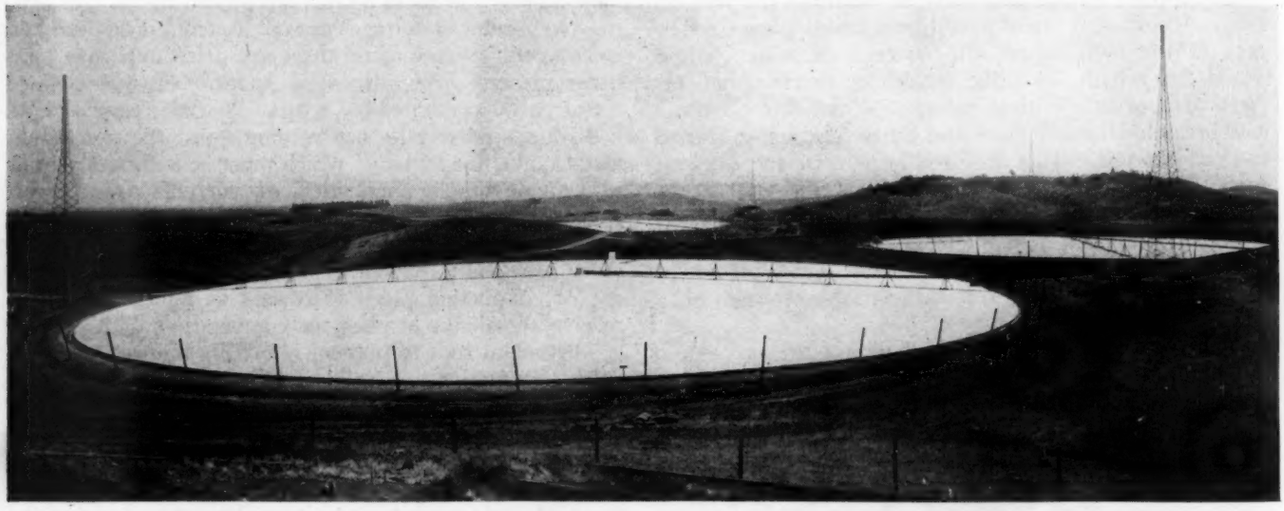
relied upon to handle direct strokes and therefore should be of such height and spacing as to insure their taking direct strokes. From his laboratory tests he has found certain relations for these heights and spacings for various cloud heights, his tests having been carried out with miniature strokes of various wave forms in order to simulate as closely as possible a stroke as it actually occurs. It is obvious that the lower the thunder cloud the less will be the area protected by the lightning rod. This is apparent, since a low cloud approaching a rod is able to approach closer to it than a high cloud before the distance from the rod's point to the cloud becomes comparable to the distance from cloud to ground. The accompanying curve (Fig. 19 Peek's A.I.E.E. Salt Lake paper, September, 1926) is the one given by Peek to bring out this point. The measured curve is seen to lie below the calculated one and would undoubtedly give relations nearer those expected in the field. From this curve it is seen that with a thunder cloud 1,000 ft. high, which is about the lowest encountered, a 100-ft. rod or tower will protect an area of 400 ft. radius, since a cloud-to-rod ratio of 10 (1,000 : 100) on the curve gives a protective ratio of 4 (400 : 100). Peek advocates arranging the towers so as to guard all approaches to a tank farm or reservoir. The height of tower used in determining its protective ratio over a reservoir should be its effective height, which is the distance it extends above the roof peak, or the tower height minus the height of the roof or other object on it that is not to be struck. In his recommendations Peek particularly stresses the need for good connections to ground to insure proper conduction of lightning currents, and sufficient distances from towers to reservoir walls to prevent sideflashes to the latter.

Dr. E. R. Schaeffer (Johns-Manville) has also been very active in assisting the oil companies in the investigation of adequate protective systems. He has devoted considerable time to the study of internally induced sparks and has developed various relations with respect to the proper arrangement of overhead networks for the reduction of induced voltages (*Bulletin* American Petroleum Institute, Vol. 7, pages 168-171, April 2, 1926). With a network of overhead parallel wires the separation of which is equal to the height above the reservoir roof he has found that the net will take 74 per cent of the charge. He has also investigated the probability of direct hits both from tests and from studies of the dielectric field about a reservoir farm with and without protective towers. From these he has indicated the proper arrangement of towers, the necessary heights of which he feels the work of Peek has determined.

Tower and Net Protection

One of the protective systems illustrated herewith is an example of an installation making use of protective towers for direct strokes and an overhead network for lessening internally induced voltages. This particular installation is that of the Shell Company of California at Martinez, Cal., and is typical of the tower and net protective systems of the Shell, Associated and Union Oil companies in California. In all these cases the networks are suspended about 12 ft. above the reservoir roofs. As an added precaution against ignition of vapors by internal sparks the interior space over the oil is filled with inert gas.

The arrangement of towers and network for this installation is shown in one of the accompanying diagrams. With the height of towers equal to 150 ft. and the wooden poles supporting the net about the reservoir 14 ft. high, the effective height of the towers becomes 136 ft. From the dimensions of the reservoir and the spacing of the towers it is seen that the entire reservoir is intended to be protected from an overhead cloud using a protective ratio of a little less than 4.



TOWER AND NET SYSTEM OF LIGHTNING PROTECTION INSTALLED BY THE SHELL COMPANY OF CALIFORNIA

The grounding arrangement at this reservoir consists of a No. 6 bare copper wire buried in a trench around the reservoir, to which all the guy wires of the net supports and the tower legs are connected. For securing grounds most companies resort to driven pipes or buried plates. Many engineers feel that the grounding system should include connection to all underground water and oil piping. In country where good grounds are particularly hard to reach, such an interconnected network of pipes having good conducting joints should provide a desirable means of securing a low-resistance path to ground for the lightning current.

Cage System

Most lightning protection systems presuppose the occurrence of cloud discharges in the form of lightning strokes and are therefore arranged to take care of them. A system wholly different in principle and known as the

Cage system proposes to drain off and equalize the charge between cloud and earth as rapidly as it is formed and thereby eliminate all strokes in the vicinity of the area being protected. Instances have been cited in the past where high towers and other elevated conducting structures have eliminated in part or in whole lightning disturbances in their immediate vicinities, which existed prior to their construction. Theories proposing to explain this phenomenon have attributed it to the fact that the points on the elevated structures, being in a very intense field, have sent out streamers which mark the paths of current flowing up from ground and into the region above to neutralize the opposite charge built up there.

Although the time of a lightning flash is less than a thousandth of a second, it requires considerably longer than this for the charge on the cloud to build up to breakdown potential. Accordingly it is felt that this time lag is great enough to allow the points to drain off the charge at a sufficient rate to prevent creation of voltage necessary to cause lightning strokes between clouds or from clouds to ground, and thereby eliminate all danger from direct hits and from induced voltages. In the work of C. T. R. Wilson, Simpson and others the amount of charge in a thunder cloud and the probable current brought down by rain have been estimated.

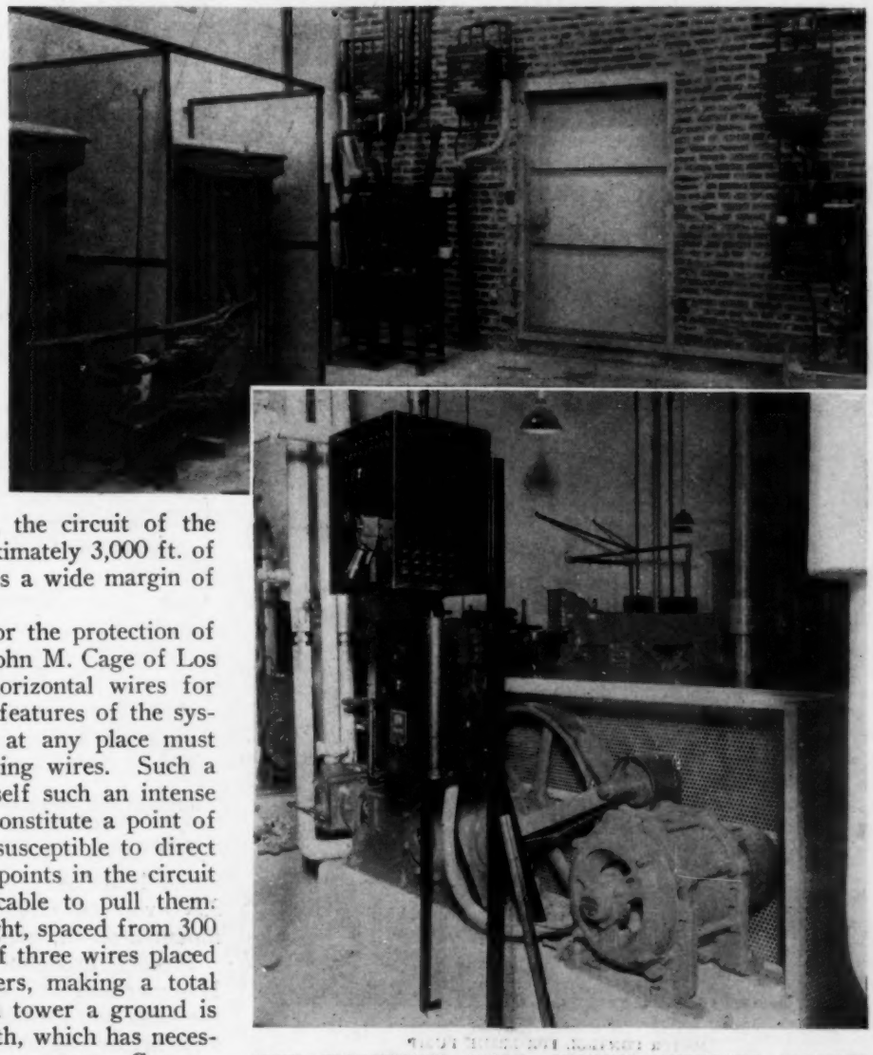
Quantitatively, the problem in lightning protection with this system is to provide a sufficiency of leakage points so distributed as completely to discharge all clouds which might otherwise become dangerous. Developers of the Cage system state that they have established beyond doubt that a flow in excess of 400 micro-amperes per lineal foot of protective system may be counted upon. Data available lead them to believe that a continuous flow of 20,000 micro-amperes will neutralize the charging rate of a cloud one mile in diameter. Inferentially 50 ft. of such a system would therefore neutralize such a cloud. However, the circuit of the smallest installation made has approximately 3,000 ft. of exposed barbed wire, so that there is a wide margin of safety over and above that required.

The Cage system, as developed for the protection of oil storage tanks and reservoirs by John M. Cage of Los Angeles, makes use of barbs on horizontal wires for dissipating the charge. One of the features of the system is that no point of any kind at any place must project above the cordon of protecting wires. Such a projecting point would gather to itself such an intense stream of ionization that it would constitute a point of potential danger rendering it more susceptible to direct strokes. The wires are the highest points in the circuit and as nearly level as it is practicable to pull them. Steel towers from 80 to 95 ft. in height, spaced from 300 to 400 ft. apart, carrying a cordon of three wires placed in a horizontal plane of 4-ft. centers, making a total spread of 8 ft., are used. At each tower a ground is made directly into water-bearing earth, which has necessitated going to depths of 95 ft. in some cases. Connection is also made to convenient water pipes and the property line fences, to insure good ground connections. Also frequent connections are made to every portion of the tanks or reservoirs to be protected, to bring them fully into the system.

In an effort to secure reliable field data on the prospective value of steel masts or towers of the type being used for reservoir protection the Pacific Coast group of the American Petroleum Institute's general committee on fire prevention set up during the summer of 1927 at a point in the high Sierras, where lightning storms are reported to be very frequent, a number of 100-ft. lightning rods and two station observers to watch these rods and note any hits or other phenomena that may be of interest or value in the solution of the problem. The work of this committee should prove invaluable in guiding oil companies in their efforts to secure adequate protection.

Finds Service Reliability of Prime Importance

UNINTERRUPTED service and dependability of every piece of electrical equipment were the dominant factors in laying out the electrical installation in the new Sears-Roebuck southern California branch recently



ABOVE—TRANSFORMER VAULT, SHOWING AUTOMATIC TRANSFER SWITCH IN LEFT BACKGROUND. BELOW—CONTROL EQUIPMENT AND 20-HP. U. S. BALL-BEARING MOTOR ON EMERGENCY AIR PUMP

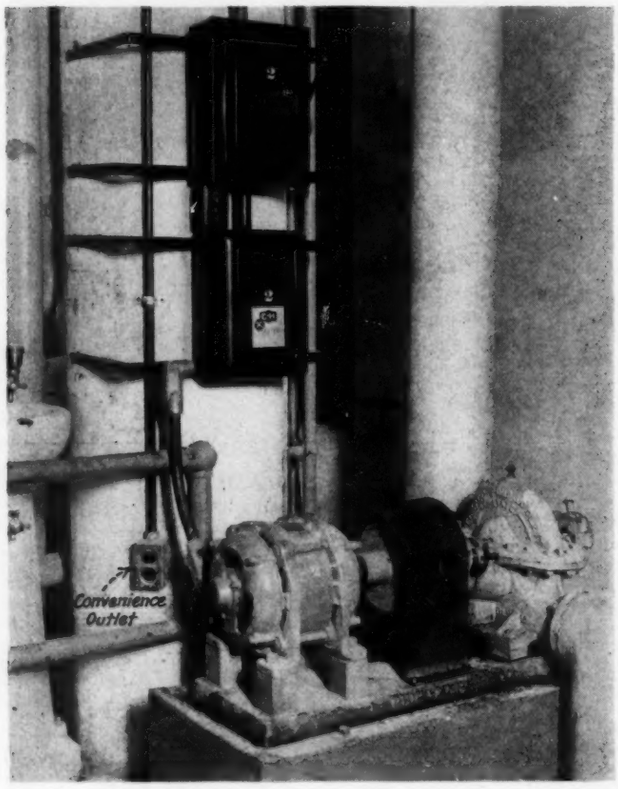
MAIN LIGHTING AND POWER BOARD, USING CARBON AIR BREAKERS IN NEW SEARS-ROEBUCK BUILDING IN LOS ANGELES

completed in Los Angeles. To this end the Los Angeles Gas & Electric Company has provided two sources of 2,300-volt feed from separate substations to the transformer vault located in the building with a special General Electric double-pole automatic transfer oil switch so that in case of power failure on the preferred feeder the substation will be thrown over to the emergency feeder and remain there until service is restored on the preferred feeder, when it will be transferred back. If both feeders should go dead at the same time, there is no operation of the switch, but if service is restored on the emergency feeder first, the substation is immediately automatically switched over to that source.

Power is supplied at 220 volts from a bank of three 150-kva. transformers, whereas the lighting load is balanced on the three phases and is served from three 200-kva. transformers. Emergency lighting is taken off from two phases only and in case of power failure or transformer trouble on either of these phases an automatic low-voltage carbon air breaker shifts the emergency lighting feeders on that phase over to the other phase.

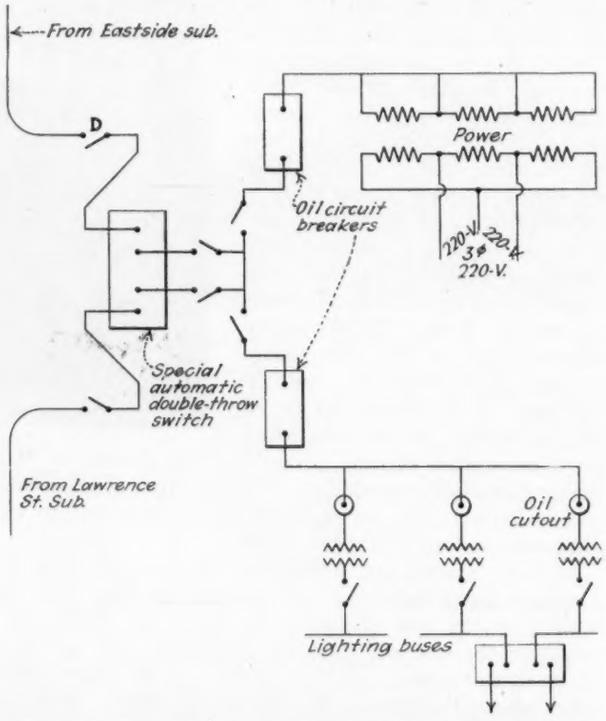
The normal lighting feeders serving each of the ten floors of the building are so interlaced that in case of power failure or transformer trouble on any one phase only one-third of the lights on any one floor will be out.

There are eleven two-pole lighting and eleven three pole power feeder breakers on the main board, all of the carbon air break type, rated at 600 amp., made by the Cutter Company. All breakers are set to carry a 50 per cent overload for two seconds before tripping. The entire board may be killed if desired by non-automatic 2,300-volt oil circuit breakers with operating handles mounted on the main switchboard.



MOTOR CONTROL FOR BRINE PUMP

Note the convenience outlet near the base of column for extension cords, portable drills, etc. Such outlets have been generously provided around the boiler plant and engine room and elsewhere in the building where there may be occasion to use portable lamps or motors.



SUBSTATION WIRING DIAGRAM, SHOWING AUTOMATIC TRANSFER SCHEME TO INSURE RELIABILITY OF SERVICE

Motors throughout the plant are operated by Cutler-Hammer magnetic starters and push-button control, with the push buttons conveniently located to the operator of a particular machine or motor. All motors are protected with a U-Re-Lite indicating safety switch, and in case of the larger motors a safety fuse switch is used in addition.

Power-Factor Correction

in Tube Mill

Engineering and economic analysis of motorization is essential preliminary step in comparing merits of methods of correction. Costs and savings must be balanced

By W. J. HERRICK
Engineer National Electric Condenser Company

POWER-FACTOR correction in any industrial plant should be preceded by an engineering analysis of the plant as it is operating. This analysis should involve a complete study and test of plant motors to determine the best motorization and to fix the causes of low power factor under operating conditions. A further analysis must be made to show the savings in kilovolt-amperage demand in kilowatt-hours of energy, operating time per machine, maintenance costs and in increased production that can be brought about. The final step is a balance of costs and savings in terms of the completed correction job.

A typical example of the results that may be obtained by this approach to power-factor correction is found in study of the demand, kilowatt-hours, use of energy and the duty of a tube mill. A preliminary step was the power cost of the mill during the previous year. Power was purchased under a penalty and bonus rate system for power factor. On the basis of a 95 per cent power factor the customer could have saved $150 per month, or $1,800 during the previous year. Since this was a normal business year, this figure was accepted as the sum to be balanced against the cost of power-factor correction. A test was made with the plant running normal, which showed the power factor to be 50 per cent. This showed that 120 kva. in corrective equipment at the metering point would be required to raise the power factor to 95 per cent.

A survey was made of the connected load, machine operation, duty cycles of machines and plant motorization, which showed distinct possibilities of reducing the amount of corrective kilovolt-amperage by revamping the motorization of the plant. Tests were made on motors, and the plant motorization was changed to conform to the results of these tests. Some of the test results were as follows:

Case I.—One 15-hp., 900-r.p.m. standard squirrel-cage motor, 220 volts, three phase, 60 cycle, operating straightening rolls.

Test 1.—Passing $\frac{7}{8}$ in. by No. 9 gage tubing:

	Kw.	Per Cent Power Factor
No load	0.6	
Load	1.4	19
Test 2.—Passing tubing $3\frac{1}{2}$ x $\frac{7}{8}$-in. wall:		
Normal pressure	4.8	52.9
Maximum pressure	7.0	57.0
Test 3.—Passing $2\frac{1}{2}$-in. x No. 10 gage tubing:		
Straight tube	1.8	24.2
Bent tube	2.4	27.5

The maximum pressure in Test 2 was never used. It was obtained on test only to determine the peak load of the machine. Test 3 represented the average working condition on the machine.

Case II.—One 20-hp., 900-r.p.m. standard squirrel-cage motor, 220 volts, three phase, 60 cycle, operating draw bench.

Maximum load on this bench—drawing $1\frac{1}{2}$ x $\frac{3}{16}$-in. wall pulled to $1\frac{1}{4}$ x $\frac{5}{32}$-in. wall. Average length of tube, 14 ft.

Test 1.—

	Kw.	Per Cent Power Factor
Maximum steady load	10.00	79
Average load	8/9.60	
Peak swing load	11.2	

Case III.—One 5-hp., 720-r.p.m. standard squirrel-cage motor, 220 volts, three phase, 60 cycle, operating a reversing roll. This motor reversed anywhere from 5 to 27 seconds, depending on the length of tube.

		Kw.	Per Cent Power Factor
Test 1.—$\frac{5}{16}$ in. x No. 20 gage	12 ft. lengths	0.7	18.6
Test 2.—$\frac{1}{16}$ in. x No. 18 gage	20 ft. lengths	0.75	19.3
Test 3.—$\frac{1}{16}$ in. x No. 18 gage	30 ft. lengths	0.7	18.6

When this motor reversed, it thrust a reactive load of 13 reactive kilovolt-amperes onto the line. Load condition in test 3 represented 25 per cent of the working time.

These tests proved that many motors were too large for the loads they were operating. The test results in Case III showed that the motor was not only too large for the job but not the proper type motor for this class of service. A 3-hp., 720-r.p.m., standard squirrel-cage motor of the same characteristics and make as the 5-hp. motor had burned out on this job. It was thought to be too small and the 5-hp. motor had been installed. The tests showed that this 5-hp. motor could be replaced by a new 1.5-hp. motor of the proper type. It would operate the load satisfactorily at an average power factor of 67 per cent. The 15-hp. motor in Case I could be replaced by the 5-hp. motor in Case III. The 20-hp. motor in Case II could be replaced by the 15-hp. motor in Case I.

Thus by the purchase of a 1.5-hp. motor this plant could remove 18.5 hp. of excessive motor capacity from service. Additional motor tests proved that by the purchase of a total of 3 hp. in new motors 35 hp. could be removed from service and that these motor changes

would reduce the condenser capacity required from 120 kva. to 96 kva.

The analysis further proved that the elimination of excessive motor capacity and the loss in power caused by motors of the plant operating at their varying power factors would result in a saving of not less than $100 per month, or $1,200 per year. The charge for low power factor of $1,800 per year plus the saving that could be made in reduced power consumption made a total estimated saving of not less than $3,000 per year. While the study for power-factor correction was in progress the plant management planned to add several machines during the next six months, which increased the amount of condenser capacity required from 96 kva. to 113.75 kva.

Corrective Methods Studied

The next step in the analysis was to study the best type of correction to apply and to balance costs against savings. The following cases were considered:

Case I. Synchronous Motor.—Practically all the machines were operated by individual drive. The largest motor in the plant was 25 hp. Several 20-hp. and 25-hp. motors operated draw benches. Since this type of drive did not justify the installation of a synchronous motor, the application of this type of equipment was not considered further.

Case II. Synchronous Condenser.—The application of a synchronous condenser at the metering point for the correction of power factor was not considered, because it was not the most economical type of corrective equipment available.

Case III. Group Condenser.—The next step was to consider the application of a concentrated group station condenser at the metering point. The smallest unit it would be advisable to consider for application was 120-kva. The installation of this type of corrective equipment would eliminate the charge for low power factor of $150 per month, or $1,800 per year. It would not, however, eliminate the wattless current from the distribution wiring or improve the voltage conditions at the motors.

The installation of the concentrated group static condensers also would introduce the losses of the necessary transformer capacity for this size unit, since the plant was metered on the secondary side of the service transformer.

From a test at a previous date on a 120-kva. group condenser installation in another plant it was found that the operating loss was 4.5 per cent. On this basis and assuming that the condenser was operated only during the working hours of the plant, the operating cost would amount to $396 per year.

The operating cost would reduce the saving from power-factor correction, making a net saving for the plant of $1,404 per year, at an installation cost of $3,800. If the group condenser were left in continuous operation, the operating cost would amount to $1,038 per year. The group condenser would require a certain amount of maintenance, which in this instance was estimated to be $100 per year.

The return on the investment in the equipment, providing no depreciation or interest on the investment is considered, would amount to 34.3 per cent.

Case IV. Combination Group and Individual Static Condensers.—A study was made of the application of individual static condenser equipment by balancing out the amount of condenser capacity required for economical operating power factor on the principal motors, small groups to be applied at panel boxes from which fractional horse-power or intermittent-duty motors were operated and a small group applied at the metering point for general correction.

This analysis showed that the installation of 96 kva., based on the tests that had been made on the plant and operating conditions, would maintain a plant power factor of not less than 95 per cent and produce a saving of $1,800 per year in removing charges for low power factor and not less than $1,200 per year in reduced demand and kilowatt-hour consumption.

Taking into account the increased load planned for in the near future, it was necessary to figure on the installation of 113.75 kva.

The return on the investment for this installation, without considering depreciation on the equipment and interest on the investment, would amount to 42.5 per cent.

The calculated saving of $1,200 per year was a minimum saving, as the operating cost of the individual static condensers was deducted from the total saving.

Comparison of Methods of Correction

As a summary of the comparison, the following table gives the significant data:

	Cost Installed	Yearly Saving
Individual static condensers	$7,053	$3,000
Group static condensers	3,800	1,404
Difference	$3,253	$1,596

When the management made this comparison and found that after the equipment had paid for itself the investment in the combination installation of individual and small groups would produce a return of $1,596 per year more than the group installation, it was decided to install the combination installation. The investment also showed that large motors produced losses and added to losses on the distribution wiring; also it was shown there were excessive losses due to low load factor and correspondingly low power factor, which were seriously affecting the voltage at the motor terminals. These voltage drops and losses resulted in a loss in production, as was proved after this installation was made.

There was a further advantage in making this type of installation because correction for future growth could be provided for at the time added motors were installed to take care of increased requirements.

Savings Produced.—An analysis of plant operation over a period of three months after the completion of the condenser installation proved that the saving in power amounted to an average of $287 per month. This compares favorably with estimates for the minimum monthly saving at the time of the investigation that the savings would amount to not less than $250 per month. Since the job was completed the plant power factor has never been below 97 per cent.

The production for these three months when compared with the yearly production for the previous year showed a material increase.

Other Favorable Results.—In addition to the savings mentioned, the following advantages were gained by this installation.

1. The excessive heating of the distribution wiring was eliminated.
2. Fuse blowing was materially reduced.
3. Maintenance work was reduced approximately 75 per cent.

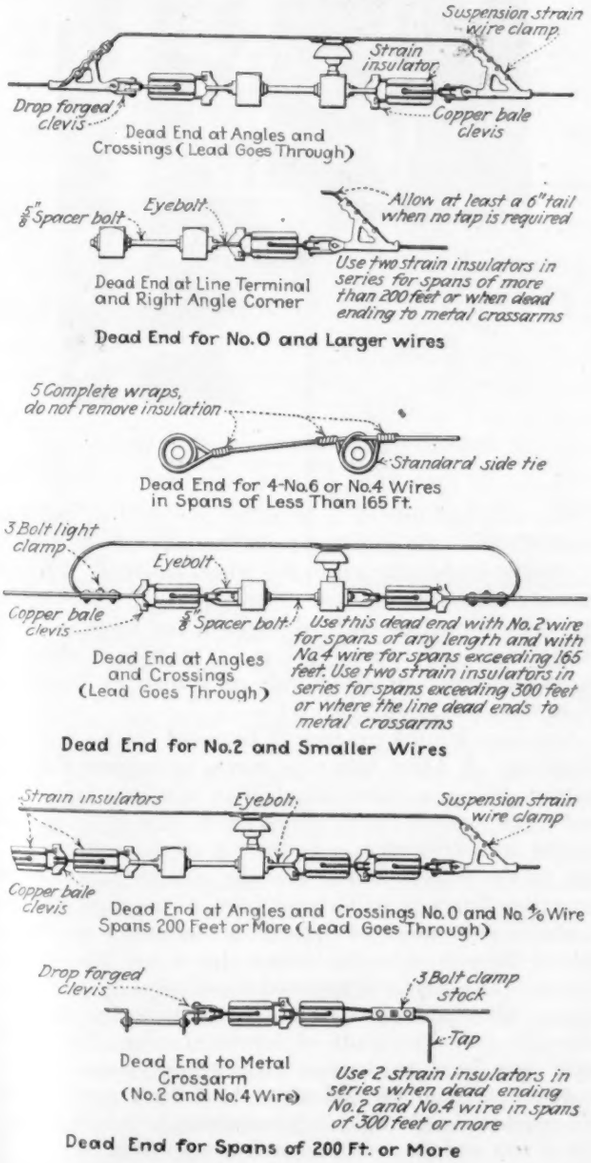
4. Maintenance materials were reduced in the same proportion.

The chief electrician had only one objection to the installation of condensers as they were applied, and that was that prior to the installation of condensers the heat from the service transformers was sufficient to heat the switchboard room and repair shop in the winter. After the installation of the condensers it was necessary for him to turn on steam in order to heat these rooms. Since the load was metered on the secondary side of the transformers, the central-station company was supplying this heat.

The tests were started in April, 1924, and the total job, including the added load, was completed in March, 1925. The saving that was made in purchased power alone has paid for the complete installation of condenser equipment.

Dead-End Construction for Distribution Circuits

Standards of West Penn System


Suspension strain wire clamp
Strain insulator
Drop forged clevis
Copper bale clevis
Dead End at Angles and Crossings (Lead Goes Through)
5/8" Spacer bolt
Eyebolt
Allow at least a 6" tail when no tap is required
Use two strain insulators in series for spans of more than 200 feet or when dead ending to metal crossarms
Dead End at Line Terminal and Right Angle Corner
Dead End for No. 0 and Larger wires
5 Complete wraps, do not remove insulation
Standard side tie
Dead End for 4-No. 6 or No. 4 Wires in Spans of Less Than 165 Ft.
3 Bolt light clamp
Eyebolt
Copper bale clevis
5/8" Spacer bolt
Use this dead end with No. 2 wire for spans of any length and with No. 4 wire for spans exceeding 165 feet. Use two strain insulators in series for spans exceeding 300 feet or where the line dead ends to metal crossarms
Dead End at Angles and Crossings (Lead Goes Through)
Dead End for No. 2 and Smaller Wires
Strain insulators
Eyebolt
Suspension strain wire clamp
Copper bale clevis
Dead End at Angles and Crossings No. 0 and No. 4/0 Wire Spans 200 Feet or More (Lead Goes Through)
Drop forged clevis
3 Bolt clamp stock
Tap
Dead End to Metal Crossarm (No. 2 and No. 4 Wire)
Use 2 strain insulators in series when dead ending No. 2 and No. 4 wire in spans of 300 feet or more
Dead End for Spans of 200 Ft. or More

Coal Spout Oscillators

SHORTLY after the High Bridge station of the Northern States Power Company was put into operation the need for some kind of a coal spout oscillator became very evident. One new factor that contributed to this need is that the furnaces have a high setting, and this necessitates extra long coal spouts in order to reach from the overhead bunker to the coal hopper. These spouts are supported at their upper ends so that they may be swung in a plane parallel to the front of the boiler, and as they are full of coal, manual operation is a very heavy job. In order to eliminate this heavy work and to reduce firing labor costs the "coal spout oscillator" was constructed and has been placed in successful operation.

The method of operation of the spout swingers may be said to be "hydraulic." A small gear pump is mounted near the end of the stoker speed shaft. This pump is connected with an interlocking clutch to the speed shaft and pumps oil to a 6-in. x 5-ft. cylinder, which is equipped with a piston. Piston rods extend from both sides of the piston, and the end of each of these rods is fitted with a pulley, which acts as the moving pulley in a simple block and tackle. The spouts are spaced an equal distance from one another and are tied together with cable. The other end of the cable, after passing through the pulleys of the mechanism, is anchored to the boiler front. The cycle of operation is as follows: Oil enters one end of the cylinder and forces the piston toward the other end. This exerts a pull on the movable pulley on the trailing end and draws the spouts. Since the pull is exerted on the movable pulley, the spouts travel twice as far as the piston. When the piston reaches the end of its travel, it operates a differential valve and the direction of motion is reversed.

The gear pump is connected to the oil cylinder by ½-in. piping and exerts an average pressure of 25 lb. per square inch. At High Bridge the time required for a complete swing of the spouts is about 6½ minutes on the slowest stoker speed. This, of course, is determined by the actual speed of the stoker, which, in turn, also determines the coal requirements.

Some of the advantages of the coal spout oscillator are as follows:

1. It assures a definite and uniform supply of fuel in the stoker hopper, and this tends to keep the fire in good condition. With the old hand method of swinging spouts the hopper would occasionally run empty, especially in the corners. This would result in an uneven fire and more than likely mean a hole of ever-increasing size in the fuel bed. At normal ratings the time required to work this hole back to the ashpit would be about two or three hours. For this period the area in the vicinity of the hole would give CO_2 readings as low as 8 or 9 per cent. Then, with the same air flow through the boiler as before the hole developed, other areas would no doubt produce CO. But with the coal spout oscillator in operation it is found that the coal is spread evenly and the fire is more uniform. Another interesting point in this connection is that this uniformity of feed is reflected in the amount of coal fed per retort per stoker revolution. This makes it possible to get a more accurate record of daily fuel consumption from stoker counter readings.

2. It gives a uniform size distribution of coal, which

tends to improve the fire. The mechanical swinger does not have a tendency to throw the lump coal to the ends of the stoker hopper, as swinging the spouts by hand does, but distributes the lumps uniformly along the length of the stoker hopper. This uniform size distribution results in a more uniform fire, and with a better fire the economy of the entire boiler unit is increased.

3. It helps to prevent coal from "hanging up" in the overhead bunkers or coal spouts. When coal is damp, it holds up in the overhead bunkers and spouts, and sometimes even in the stoker hopper itself. This necessitates poking the coal in the bunkers, or pounding the spouts to get the coal to run. With the spout swinger in operation, however, this difficulty is eliminated, as the coal is kept moving all the time.

4. It gives the fireman more time to watch the fire and other stoker conditions. For instance, if a sudden increase in load comes on the station, the fireman's time is all taken up in the proper operation of the stoker, and freedom from the labor of swinging these spouts by hand gives him more time to pay strict attention to the condition of the fuel bed and the operation of the stoker and boiler. If proper supervision is provided, it may be said that the more time the firemen have to study the condition of the fire the higher will be the boiler room efficiency.

5. It reduces stoker maintenance, as thin spots or holes in the fuel bed have a tendency to burn out stoker parts in that vicinity.

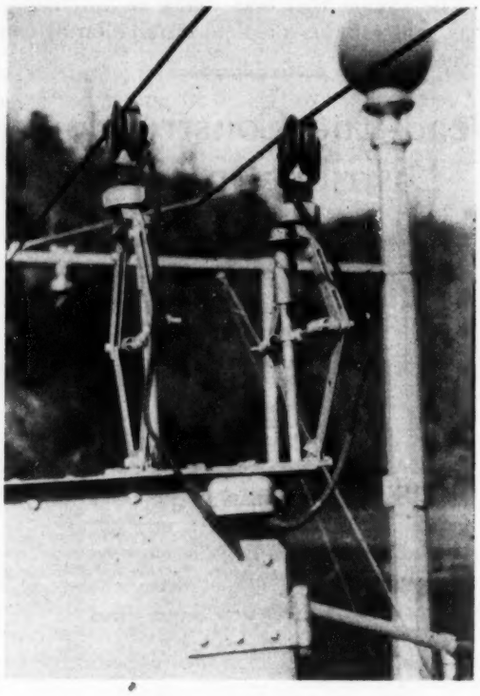
6. It contributes to the cleanliness of the boiler room. When coal spouts are swung by hand and the coal comes to a sudden stop at the end of the swing, a cloud of dust generally escapes from the top of the spout, but when the coal spout oscillators are used, no sudden change in velocity occurs and the reduction in the amount of coal dust in the boiler room is surprising, particularly when dry coal is being used.

7. It reduces the boiler room labor costs either by giving the firemen more time for firing or by an actual reduction in the number of "firemen helpers." In one plant, which has ten boilers fired with fourteen retort stokers, the installation of coal spout oscillators resulted in reducing the boiler room labor cost $4,000 per year.

Pantograph for Gate Hoist

By J. Elmer Housley

CURRENT-COLLECTING devices for slow-moving equipment such as gate hoists present some engineering problems. Portable cables are very inconvenient where other traffic uses the deck space and are subject to wear and tear which may be avoided by better planning. At one hydro development the difficulty has been satisfactorily solved by the installation of two No. 4/0 trolley wires with a pantograph as shown in the illustration. The gate is equipped with two 10-hp. direct-current series motors so arranged that the hoist and traveler motor cannot be operated at the same time. The roof of the motor housing serves as a deck for the mounting of the pantograph, which is constructed of $\frac{1}{8}$x2-in. iron bar and light angle iron and is arranged for a slotted base. Two vertical sliding pipes serve as a guide to prevent side bending of the inherently flexible construction. The lower pipe is fastened to the roof by lock nuts on each side of the roof. The upper pipe slides over the lower and the former is attached to the movable portion of the pantograph with a pipe cap to prevent the entrance of moisture. A lock nut secures these parts in position on the under side of the attachment. The cap from one of the trolley wire support assemblies seen in the background is used as an insulator. A standard trolley wheel and collecting spring have been fitted in a U-shaped steel base-piece. Lateral motion is taken care of by pivoting the U-shaped wheel assembly so that an arc of about 40 deg. may be described by the trolley wheel. This takes care of the slight displacement of the trolley necessitated by the construction of the track



PANTOGRAPH ELIMINATES USE OF FLEXIBLE CABLES FOR HOIST MOTOR

which was laid out on a smoother curve than could be obtained with the point-to-point support of the trolley. A flexible cable attached to the wheel assembly is looped into a condulet fitting just under the roof. Two helical springs are used on each pantograph and have an inside diameter of approximately $\frac{1}{2}$ in. The wire is about $\frac{1}{16}$ in. in diameter, and the springs are similar to those used to support porch swings.

Standard mining practice is followed in the line construction. A $1\frac{1}{4}$-in. iron pipe serves to support the conductors, the pipe being attached to cast-iron lampposts, and a guy extends from the end of the pipe to an eye-bolt tapped and screwed in near the top of the column. The end of the pipe is attached to the post by means of an encircling band of half-round iron. Two guys running to the concrete deck of the dam a few inches on the far side of the posts take the vertical thrust and serve as side braces. The guys are fastened to the pipe by strap-iron clips. All metal parts of the hoist, lamppost and line material carry three coats of aluminum paint. The equipment has been in service about three years without maintenance and no difficulties have been encountered. No sparking of the wheels is noticeable when the trolleys are at rest and the hoist motor is in operation.

Sound Utility Financing

Fostered by Regulation

Attention of smaller companies called by commissioner to benefits of refinancing at present favorable money rates. Equity financing now dominates

By WALTER J. FITZPATRICK

Chief Accounting Division, Public Service Commission of New York

DURING the present calendar year to date securities have been authorized by the commission to the amount of $450,000,000, of which $355,000,000 was stock and $95,000,000 bonds, or 78.8 per cent stock and 21.2 per cent bonds. In the early days of this commission 88 per cent of the securities were issued in the form of bonds and the balance, or 12 per cent, in the form of stock. According to the rules of finance, this represents an extremely healthy condition for the gas and electrical companies and eliminates to a certain degree a criticism of Professor Ripley, made in his article on "The Public and Its Utilities," wherein he states that for the public utilities the normal minimum of funded indebtedness is about 60 per cent of the total capitalization, with the balance more or less evenly divided between preferred and common shares, and says further that the excess of bonds over stock constitutes a certain menace to the financial structures of such corporations.

THE background of utility financing seen by public utility commission officials differs somewhat from that seen by the utility executive. In his discussion this week before the annual convention of the Empire State Gas and Electric Association, part of which is here reproduced, Mr. Fitzpatrick made some pertinent suggestions to company executives, particularly in reference to those elements which go to strengthen a company's financial structure.

By far the greatest part of the credit for the high financial standing of these companies is due to the wise manner in which they have been managed, but also I contend that to no small degree have the companies been benefited by regulation. Such regulation of public utility companies has resulted in stabilizing to a very great extent the value of their securities, and these securities are being recommended more and more as a safe and prudent investment. In the days before regulation became effective the issuance of securities was a matter of negotiation between the president of the company and the banker both as to form and amount of security to be issued and the price the banker was willing to pay the company for same. Records as they exist today from an accounting standpoint were unknown, and the banker was more interested in the earnings as reported than in any other statement.

Other factors which were very prominent at that time and which have almost entirely disappeared received consideration. Among these factors was that the gas and electric business had a large element of risk apart from its management. This risk came from the fact that franchises to operate were often granted through political favor and at a cost which varied with the importance of a company. The procuring of a franchise and its exercise did not always guarantee the holder protection of his investment, for many are the instances where duplicating franchises were granted to individuals or rival companies to operate in the same territory. This meant the paying of a large sum of money to purchase the new franchise from its holder at an exorbitant price or a duplication of plant and system resulting in a destructive competition. The banker took all of these factors into consideration in naming his price for the securities and usually demanded in addition thereto a certain amount of stock for himself as a bonus. I am satisfied that this explains to a large degree such items as "franchises and goodwill" set-up on the books of public utility companies of this state as covering the period prior to the year 1908. The records of these companies fail to show that the amounts charged to these accounts were ever paid to the state or political subdivision thereof for such rights and privileges as the accounting rules prescribed by the commission today directs, but unquestionably a large part of such items in the days before regulation represented memoranda accounts of moneys paid for rights and privileges and for their protection. How different the system today where the rights and privileges legally granted are protected and the public is assured of efficient service at a reasonable rate!

COST OF NEW CAPITAL

A matter of vital importance to a company is the cost to it of money necessary to finance its business. This cost is more or less regulated by general business conditions. In times of active business, when there is but little unemployment; when retail trade, building construction and net freight-ton miles show a normal increase,

and when crops are abundant, the cost of money is lower than at times when there is a depression in business. For several years past this country has enjoyed a period of almost unprecedented prosperity, and the indications are that this will continue for at least the rest of the year. All of these factors, together with the reduction of rediscount rates at Federal Reserve banks, have helped to establish lower interest rates. Many companies have taken advantage of the present conditions to refinance themselves by the issuance of bonds bearing interest at the rate of 4½ or 5 per cent to refund outstanding bonds paying interest at the rate of 6 to 7 per cent and also to call in preferred stock paying dividends at rates of 7 to 8 per cent, issuing instead stock paying dividends of 6 per cent. In a recent case before the commission one of the larger electric utility corporations was authorized to issue $70,000,000 of its new 4½ per cent bonds to be sold at not less than 93 per cent of their face value and to use the proceeds for capital purposes, including the refunding of approximately $37,000,000 face amount of bonds of underlying companies, which bonds bore interest varying from 5 to 6 per cent. The cost of the money to the company in this instance is approximately 4.9 per cent, and this is regarded as a very favorable piece of financing. It was only six or seven years ago when the average cost of money to public utilities in this state was approximately 8 per cent, and in one instance, of a gas corporation, I recall it was over 11 per cent. The larger and stronger companies have generally taken advantage of the present money market, but many of the smaller companies have as yet to avail themselves of the advantages of cheaper money by the refunding of securities at a lower cost, and the attention of such companies is called to the advantage of raising capital at the present time.

Commissions' Analysis Thorough

After negotiations have been completed with one's banker for the sale of securities at a stated price, time is an important element. The banker usually fixes a price based upon market conditions as they then exist and cannot guarantee such a price beyond a reasonable time, say a month or six weeks, when conditions in the money market may have changed so as to compel a less favorable price. As you all know, an application before the Public Service Commission of the State of New York to issue securities is not a mere formality. It means a thorough examination of the books and records of the petitioner, showing the actual cost of the property, followed by a physical examination of the property in service. From personal knowledge I can state that these examinations are more thorough than those of any other regulatory body, either state or federal, and the order of the Public Service Commission authorizing the issuance of securities is a guarantee of cost which is accepted by bankers and trustees without further examination in connection with the issuance of securities. It has been my aim since I have been in charge of the capitalization department of the commission to expedite relief for the issuance of securities as speedily as possible, and I am working now on a plan, in co-operation with a committee from your association, which I expect to submit to my commission shortly for its approval which will direct all public utility companies to file with the commission at regular intervals full details of all additions and retirements to their property. These schedules can be checked regularly by the commission's accountants and the property inspected by the commission's engineers regardless of whether an application to issue securities is pending or not, so that when such an application is filed the relief may be speedily forthcoming. This will tend to allow a company to take advantage of a favorable money market with the certainty that action by the commission on its application will not be long delayed.

In addition to calling attention to the refinancing of present issued and outstanding securities by the issuance of new securities bearing lower interest and paying less dividends, I would further call attention to the capital stock of the company. The public often confuses the rate of return on investment in property with the dividends paid on the common stock and fails to understand that dividends of 8 or more per cent may be paid on such stock and yet the company may be earning less than a fair return on its investment. This may be the result of the company being undercapitalized, which may be corrected to a certain degree by the issuance of securities to the full amount it is entitled to, or may be the result of having a preponderance of bonds bearing a low rate of interest and preferred stock paying dividends of less than 8 per cent. This latter condition can be changed by the issuance of shares of stock without par value for the outstanding shares of par value. Such a change involves only amending the articles of incorporation of the company and filing them with the Secretary of State at Albany and needs no approval of the Public Service Commission.

Repairing Leaky Bearing Pedestal

By F. W. Evans
Supervisor Service Sales New York Westinghouse Electric & Manufacturing Company

THE oil reservoir of a bearing pedestal of a large synchronous converter developed a leak toward the bottom of the reservoir and at the side of the pedestal, and although the leak was not serious, it could not be permitted to remain. The operating room was located two floors above the converter room, so that constant attention could not be expected. Aside from the possibility that the bearing might run dry when the oil became warmed through operation, conditions required a remedy, as the pedestal became very messy from capillary action.

An attempt was made to lay a weld over the porous section of the casting. The electric welding process was employed, using the best quality of flux known. The weld proved to be just as porous as the casting. It was then removed by chipping sufficiently to obtain a fairly smooth surface.

The reservoir was washed both inside and outside with gasoline. Five cents' worth of whiting was obtained from the nearest paint shop. After mixing the whiting with water a coat of it was applied to the outside of the porous section. When the whiting had completely dried, the reservoir was filled with oil. A center punch and hammer were kept in hand and a very close watch was maintained over the painted spot. As the oil began to seep through it showed as a minute wet spot in the chalk-like whiting. These spots were center punched. When all the noticeable spots had been marked, the oil was removed from the reservoir. Each center-punched spot or small group of spots was then drilled and tapped. Pipe plugs had been made up of sufficient length so that they could be run in until a very tight fit was obtained. The ends of the plugs were then cut off flush with the surface of the casting. The process was repeated to dis-

cover any pores that failed to show or be detected the first time. After all plugging had been completed the section was surfaced with "Smooth-On" and painted. That the job was a complete success is proved by the fact that no sign of leaking has appeared after fifteen months of operation.

Determining the Size of Conduit Required for Cables

Proper allowances for conductor placement to avoid expensive alterations and rearrangements may be made by a preliminary survey and analysis of specifications

IN LAYING out power stations, substations, duct runs, etc., the size of conduit required for a given number and size of cables should be carefully determined so that the conduit, once laid, will accommodate the cables originally specified, without rearrangement and without construction changes. By the use of the accompanying tables and a small amount of calculations, the size of conduit required for practically all installations can be quickly determined.

The over-all diameters of the cables should, if possible, be measured or, as is usually the case, be obtained from information furnished by the manufacturer. It is advisable to refer to catalogs or bulletins supplied by the manufacturers of the particular cables being used, since the over-all diameters of equivalent cables are not standard among the different manufacturers and in some instances a difference of 25 per cent has been noted.

The proportion of the conduit area that may be safely occupied by cables which are to be pulled into the conduit are given in Table I.

Using these values as a basis, Table II and Table III were made up for the common sizes of conduit. These tables are based on the inside diameters of iron conduit, but they may also be used for fiber conduit 2 in. and larger, as the inside diameters of iron and fiber conduit in these sizes do not differ greatly. Medium length conduit runs are assumed. These are defined[2] as straight runs not more than 200 ft. in length, runs not more than 100 ft. long containing two right-angle bends, or runs not more than 50 ft. long containing three right-angle bends.

TABLE I—PROPORTION OF CONDUIT AREA WHICH MAY BE OCCUPIED BY CABLES[1,2]

Number of Cables in Conduit	Cable Area—Conduit Area
1	0.56
2	0.32
3	0.42
4	0.40
5 and above	0.37

When all of the cables to be pulled into one conduit have the same over-all diameter, the conduit size can be determined from Table II, which gives the conduit size for one to nine cables per conduit.

Example of Use of Table II

Determine the conduit size required for a medium run of three cables, each with a diameter of 0.97 in.

In Table II, for three cables per conduit, 0.97 falls between 0.92 and 1.15, or a 3-in. conduit is required.

If the cables have different diameters, a constant K is first calculated as follows:

n_1 = the number of cables of diameter d_1
n_2 = the number of cables of diameter d_2
n_3 = the number of cables of diameter d_3
.....
n_n = the number of cables of diameter d_n
K = a constant depending on the conduit size and the total number of cables in the conduit.

$$K = n_1 d_1^2 + n_2 d_2^2 + n_3 d_3^2 \ldots + n_n d_n^2$$

Then from Table III, the conduit size required is determined for the value of K and the total number cables in the conduit.

Example of Use of Table III

Determine the conduit size required for a medium run of three 1.02-in. cables, one 0.86-in. cable and two 0.39-in. cables.

$$K = 3 \times 1.02^2 + 0.86^2 + 2 \times 0.39^2 = 4.18$$

From the table, for six cables per conduit, 4.18 falls between 3.47 and 4.70, or a 3½-in. conduit is required.

When the length of the conduit run is not a "medium run," necessary allowances should be made according to each case. For instance, if in the example for Table II the run is a short straight run of 60 ft., a 2½-in. conduit will suffice. If the run were 250 ft. without bends, the 3-in. conduit would still be large enough, as 0.95 falls fairly close to the lower limit, or 0.92. If the conduit diameter fell close to the upper limit and the run were 250 ft. without bends, a 3½-in. conduit would be advisable.

[1] *V. H. Tousley, Electrical Review, Feb. 15, 1919, page 227.*
[2] *Croft, American Electrical Handbook, page 553.*

TABLE II—CONDUIT SIZES—CABLES OF LIKE DIAMETERS

Number of Cables in Conduit	Nominal Size of Conduit—Cable Diameter in Inches											
	¾ in.	¾ in.	1 in.	1¼ in.	1½ in.	2 in.	2½ in.	3 in.	3½ in.	4 in.	4½ in.	5 in.
1	0.46	0.61	0.78	1.03	1.20	1.54	1.84	2.29	2.67	3.01	3.37	3.77
2	0.25	0.33	0.42	0.55	0.64	0.82	0.98	1.22	1.42	1.61	1.80	2.02
3	0.23	0.31	0.39	0.52	0.60	0.77	0.92	1.15	1.33	1.50	1.68	1.89
4	0.20	0.26	0.33	0.44	0.51	0.65	0.78	0.97	1.13	1.27	1.42	1.59
5		0.22	0.28	0.37	0.43	0.55	0.66	0.82	0.95	1.08	1.21	1.35
6		0.20	0.26	0.34	0.40	0.51	0.61	0.76	0.89	1.00	1.12	1.25
7		0.19	0.24	0.32	0.37	0.47	0.57	0.70	0.82	0.93	1.04	1.16
8			0.22	0.30	0.35	0.44	0.53	0.66	0.76	0.86	0.97	1.08
9			0.21	0.28	0.33	0.42	0.50	0.62	0.72	0.81	0.91	1.02

TABLE III— VALUE OF K FOR CONDUIT SIZES—CABLES OF DIFFERENT DIAMETERS

Total Number of Cables in Conduit	Nominal Size of Conduit—Value of K											
	¾ in.	¾ in.	1 in.	1¼ in.	1½ in.	2 in.	2½ in.	3 in.	3½ in.	4 in.	4½ in.	5 in.
2		0.12	0.22	0.35	0.61	0.83	1.36	1.94	3.00	4.06	5.19	6.49	8.15
3		0.16	0.28	0.45	0.80	1.09	1.78	2.55	3.94	5.32	6.80	8.51	10.35
4		0.15	0.27	0.43	0.76	1.04	1.70	2.42	3.75	5.08	6.48	8.10	10.20
5 and over		0.14	0.25	0.40	0.70	0.96	1.57	2.24	3.47	4.70	6.00	7.50	9.42

Alabama Sells 1,382 Ranges in Six Weeks

IS SELLING electric ranges a matter of education? Are the advantages of electric cooking so marked that when the story is properly told the sale is well under way? Believing that both of these questions should be answered in the affirmative, the Alabama Power Company and affiliated companies—the Gulf Electric Company, the Gulf Power Company and the Mississippi Power Company—in planning their annual spring electric range campaign, which ended with record-breaking success, decided to lay special stress on demonstrations and on employees carrying the message to prospective customers. Success of the six weeks' campaign from April 15 to May 31 is considered due to the co-operation of all employees and to the method of handling demonstrations.

The Alabama Power Company, which divides its territory into four divisions, succeeded in creating much rivalry among the employees of these divisions. Special prizes were offered to each division. Twice a week selling messages were sent to the field through a special publication, the *Ranger,* which with the regular weekly sales publication, *Pointers,* kept all employees keyed up. The division managers called sales meetings regularly.

In previous years the attendance at range demonstrations had not always been as large as planned for, so, with the idea of securing the maximum attendance, H. W. Parrish, Jr., manager of appliance sales, worked out a method of using the women's missionary societies throughout the territory to sponsor the demonstrations. These societies sold tickets to their friends for the demonstrations, at which, in addition to talk on ranges, a luncheon was served, the food being furnished by the power company and a charge of 25 cents a plate going to the missionary society. By this means attendance at demonstrations was materially increased over that of previous years and in many cases members of the different societies helped in the sale of the ranges.

The operating crews also became much enthused over this campaign and vied with one another in the installation of the ranges. In many cases the crews were only a few days behind the sales force, installing practically as fast as the ranges were sold. When all ranges sold in the campaign had been installed, the range saturation per 100 customers for these companies was as follows: Alabama Power Company, 9; Mississippi Power Company, 4; Gulf Electric Company, 3; Gulf Power Company, 5.

On a conservative estimate the revenue of these affiliated companies will be increased $89,830 per year by this campaign.

The sale of 1,382 ranges in six weeks totaling approximately $207,500 is reported to establish a record that has never been equaled in the South, as regular prices were maintained throughout and time payments limited to fifteen months with a down payment of $5. The only concession made was the elimination of a carrying charge for those ranges sold during the campaign. No premiums were given.

HOW THE RANGES SOLD IN ALABAMA'S CAMPAIGN WERE DISTRIBUTED

	Quota	Number Sold	Per Cent of Quota Sold
Alabama Power Company:			
Western division	138	297	215
Northern division	155	288	186
Southern division	109	151	139
Eastern division	120	170	132
Gulf Electric Company:			
Mobile division	50	90	180
Eufaula division	20	24	120
Mississippi Power Company	175	250	143
Gulf Power Company	80	112	140
Total	856	1,382	162

TYPICAL WINDOW DISPLAY USED BY THE ALABAMA POWER COMPANY IN ITS RANGE CAMPAIGN

Rate Advertising Produces Results for Minnesota Utility

FOR several months past the Northern States Power Company has been advertising to its domestic consumers the fact that the unit cost of electrical energy decreases appreciably with increase of energy use. The results obtained have warranted its indefinite continuation.

For example, on Dec. 31, 1925, the number of residential customers was 105,103. Of these, 33,599, or 32 per cent, were on the third step of the rate. On Feb. 28, 1927, the number of residential customers was 109,460, and 62,130, or 57 per cent, were on the third step. Between these two dates is a comparatively long interval—much longer than the "third-step" advertising* was run. Therefore it is quite logical to say that the 25 per cent increase in number of users on the low rate was not wholly due to this advertising. However, in the elapsed time the total number of customers increased somewhat less than 5 per cent, whereas the number of the third step of the rate increased about 85 per cent. The wide difference between these two rates of increase indicates that something more than the growing appreciation of the value of electricity service has been at work on the public consciousness. There is no agency that can be so well fitted into the picture as the "third-step advertising."

**See Electrical World, May 21, 1927, page 1074.*

Keeping Meter Records
in Widespread Territory

System used by Southern California Edison Company is simple and avoids duplication. History card carries full list of all test data and complete record of device

By W. R. FRAMPTON

Superintendent Meter and Test Department,
Southern California Edison Company, Los Angeles, Cal.

GENERAL OFFICE OF METER AND TEST DEPARTMENT OF SOUTHERN CALIFORNIA EDISON COMPANY

AN EFFICIENT method of recording all transactions taking place within the meter and test department of a large utility is perhaps one of the most important functions of a meter department; certainly it is most vital. Any system should be as simple as possible so that all data required are easily available and it should avoid the duplication of recording data. On a large system covering a wide area such as that of the Southern California Edison Company a carefully worked out record system is necessary. A brief synopsis of the system used by this company is presented.

The territory served is large, and for this reason it is divided into 31 districts. Meters are installed and disconnected by employees who reside in the district and under the supervision of a district manager. The test department is responsible for the correct registration of meters, and this work is handled from a central headquarters.

As new meters are received by the general stores department they are forwarded to the meter and test department, accompanied by a form on which they are listed by manufacturer's serial numbers. They are then given a code number, are stenciled and calibrated, and a complete record of this operation is made on a history card. They are then returned to the stores department, accompanied by another form on which they are listed by the code number. The meters are now ready for shipment to the various districts as may be required.

When meters are shipped, a form is sent to the test department from the stores department, giving the code number of meter shipped, together with the name of the district to which it went. These data are then transferred to the history card. When the meter is installed, the district forwards a form to the test department on which is listed customer's name and address, meter number, nameplate data, reading and date installed. These data are then transferred to the history card. The same procedure is followed whenever the location of a meter is changed. When a meter is returned to the stores department for repairs, etc., the test department is notified on a suitable form and the data are then transferred to the history card. In the event of a meter being condemned for any reason another form is used and the data are recorded on the history card.

All operations are recorded on the history card in their sequence of operation, the date of the operation being the deciding factor. When a polyphase meter or a single-phase meter of 10-kva. capacity or over is installed, a "request for meter test" slip containing all pertinent data is forwarded to the test department by the district. This form is also used whenever the district is desirous of having a special test made on a particular

meter, such as complaints of high bills, etc. The request-for-test slip is given to the testman as authority to do the work, and the result of test is recorded by him on one form for polyphase meters and on another but similar form for single-phase meters. Due to the various classes of service on which polyphase meters are used, differently colored cards are used. For polyphase meters installed with instrument transformers a buff card is used; for self-contained polyphase meters on industrial

Form Test 12 75 Pads 3-25 Entered Test 11.....Test 6.....Checked.....
Reported BD 42.....Test 7.....Test 20 No.....

POLYPHASE METER TEST REPORT

District.....Town.....
Date.....Time from.....M. to.....M. Plant No.....
Name.....
Address.....

METER: No. Make A V
CYCLES: Dial K Disk K Reading
Billing constant shown on ledger.
MOTOR: No. Make Type Form
R. P. M.: H. P. V A Cycles
TRANSFORMERS: POWER:-No. Make Kva. V. Prim. V. Sec.
CURRENT:-Nos. Make Type
Watts Max. Volts RATIO
POTENTIAL: Nos. Make
Type Form Watts RATIO

	TEST METER			TEST AS FOUND					TEST RATIO	
K. W. Load	P. F.	T.M.R.	T.M.R.	Total T.M.R.	Test K	True Watt Hrs.	T	R	Meter Watt Hrs.	% Error
				TEST AS LEFT					SEAL	
K. W. Load	P.F.	T.M.R.	T.M.R.	Total T.M.R.	Test K	True Watt Hrs.	T	R	Meter Watt Hrs.	% Error

LOAD

Routine Request
Adjusted H.L. L.L. Changed Jewel Pivot T.B. Cleaned
REMARKS:

TESTED BY.....

SOUTHERN CALIFORNIA EDISON COMPANY

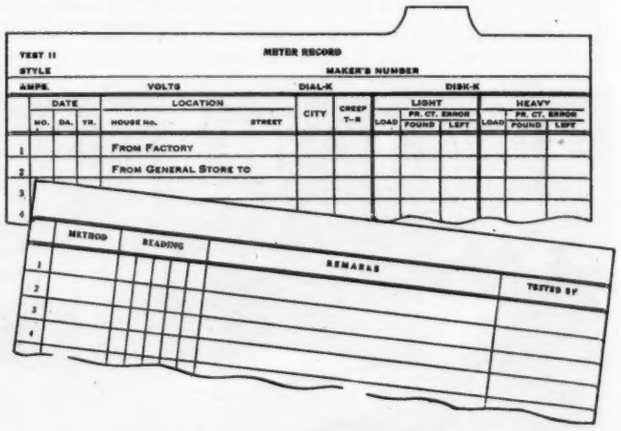
COLORED CARDS ARE USED FOR METER TEST REPORTS TO DESIGNATE CLASS OF SERVICE ON WHICH METER IS INSTALLED

installations a blue card is used, and for self-contained polyphase meters on irrigation pumping installations a salmon card is used. When the test card is returned completed, the data are transferred to the history card and also to the back of the request-for-test slip. The request-for-test slip is then returned to the district from which it originated, automatically giving the district the result of the test.

In conjunction with the history card 4x6-in. colored cards are used for record of routine tests of all single-phase meters of 10-kva. capacity or over and of all polyphase meters. The same colored designations are used as previously mentioned; in addition, a white card is used for single-phase meters of 10-kva. capacity or over. Routine lists for testing the above-mentioned class of meters originate from the test file containing the cards just described, this file being segregated according to districts, colors and years.

Whenever a meter constant is improperly reported by the district, it is corrected by a serially numbered slip listing customer's name and address and pertinent data regarding the meter. In order that the districts may know the result of the routine test made on meters, these data are reported to them on a 4x6-in. white slip giving district, name and address of customer, and meter data, after these have been recorded on the history card. Should it be necessary for employees other than those of the meter and test department to break the seal on a meter, this information is conveyed to the test department by means of a slip giving all pertinent meter data and the name of the person breaking the seal and the reason therefor.

Periodic inspections are made by the meter and test



METER HISTORY CARD WHICH FORMS BASIS OF METER RECORD SYSTEM OF SOUTHERN CALIFORNIA EDISON COMPANY

department to see that all meters are installed according to the standard practices. For this purpose a form is provided which originates from the installation report as sent in by the district. In cases where the specifications are not adhered to, and should any changes in meters be desired, the district is notified by the test department on a form with a detachable stub containing the meter data, and when this work has been completed by the district, the stub is signed and returned to the test department.

A 4x6-in. weekly time card is used for the purpose of recording the work done by outside men and the number of hours consumed in the work. On the back is the record of expense incurred, together with the auto mileage. A progressive report of work accomplished in the shop is compiled on an 8½x11-in. sheet with suitable columns showing the class of work done. A similar summary report is made for field tests. A progressive report of meters installed and disconnected is compiled on an 8½x11-in. form giving districts and meter numbers. A summary of the efficiency of meters tested in the field is compiled on a 12x17-in. form showing reason for the test and percentage slow and fast for light and heavy loads.

The following forms are filed numerically: Memos used for transfer of meters back and forth between test department and general stores; memo of shipment of meters to districts; authority for transfer of material; report of condemned apparatus; correction of meter constant; and test department inspection report. The meter history cards and reports of meter test are filed numerically by code and serial number of the meter which they

cover. The large summary sheets showing meters set and meters tested on request are filed numerically according to district. Record cards of routine meter tests are filed numerically by code and serial number of the meter covered, separated into colors and according to district. Meter seal reports are filed according to district. Test department time cards are filed alphabetically by name and according to the month.

Each meter is designated by a class number, which indicates its make, type and size, followed by a dash and the serial number of the meter in that particular class.

Distribution of Material to Industry

Survey shows where straight-line distribution should be used and where manufacturer should sell direct to industry

IN STUDYING the industrial structure of several American cities it was determined that it was advantageous for the manufacturer to sell direct to only 7½ per cent of the total number of prospects. That group, though small in number, represents a high percentage of the total volume of business. The other 92½ per cent of the units should and could be served most economically by the electrical contractor-dealer of that community. As the conditions existing in each city were found to be quite similar, a typical example is given for illustration.

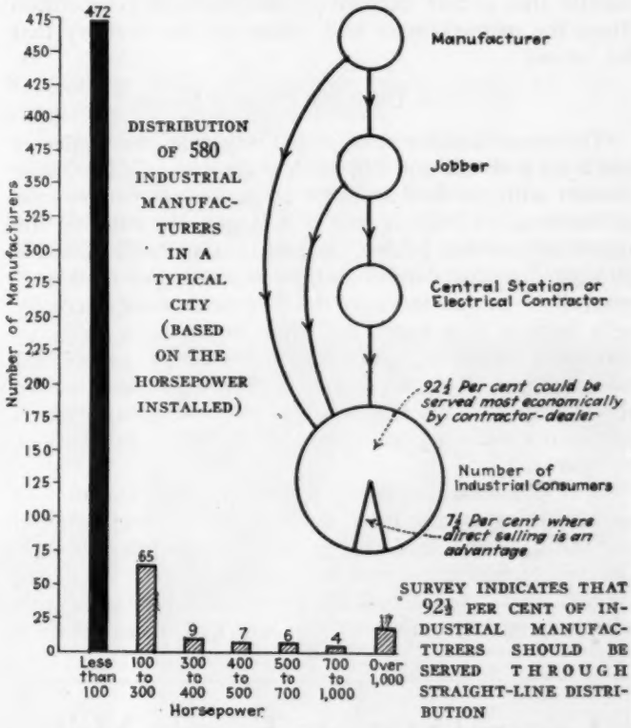
There were 580 industrial manufacturers listed by the Chamber of Commerce in the city selected. This was checked against the prospect and consumer list of the power company operating in this field. A personal interview with the operating executive of each of these plants was the method used to obtain the statistical information. All of the facts discussed at these interviews will not be covered, but those which are pertinent to this particular subject are here dealt with.

Listing these plants in the order of their importance (if the amount of horsepower installed is taken as a measure), there are seen to be seventeen industrial plants that have more than 1,000 hp. installed, four that have 700 hp. to 1,000 hp. installed, six with 500 hp. to 700 hp., seven with 400 hp. to 500 hp., nine with 300 hp. to 400 hp., 65 with 100 hp. to 300 hp. and 472 with less than 100 hp.

Three Major Industrial Groups

These plants really divide themselves into three groups. The first group of 43 plants with more than 300 hp. of installed capacity have, in nearly all cases, electrical and mechanical departments for doing their maintenance, repair and installation work. The second group of 65 between 100 hp. and 300 hp. recognized their electrical and mechanical problems, but only in a few cases did they set up a department to take care of their maintenance requirements, and in no case did they have a department equipped for doing installation work. The last classification of 472 plants with less than 100 hp. capacity had no department to take care of their electrical or mechanical maintenance and depended entirely upon outside organizations for this service. The chart shown indicates this distribution of electrical industrial manufacturers based on the horsepower installed.

An inquiry as to their method of buying showed that the first group, which were equipped to do their own maintenance and repair service, purchased almost exclusively from the manufacturer or jobber in the district. The second group, which were not equipped to do their own maintenance and repair service work, purchased from the local contractor who did their service work and from the manufacturer and jobber, depending upon the price of the material that they desired. The last group, which depended entirely on the electrical contractor for maintenance service, purchased their electrical requirements partly from this contractor and partly from the electrical manufacturer and jobber. The reason for



direct buying was to save money, although their purchase requirements were admittedly very small in this last group.

Flow of Goods

The diagram indicates how goods flow from the manufacturer to the ultimate consumer in this industrial field. Taking first the large industrial user, it was found that this organization is set up to handle its own repair business, or, in other words, have a department which functions in the same manner as an electrical contractor. Therefore, it would seem right that they should buy from the manufacturer or the jobber, depending upon the class of electrical equipment in which they are interested.

In considering the second and third groups, however, a different problem is presented. These industrial plants are dependent on the electrical contractor or central-station company (the central-station company and contractor are considered on the same basis) for their maintenance and repair service. They buy either a part or all of their requirements from this source, although they are solicited in most cases directly by the jobber and manufacturer. The purchasing power of this latter group is very small per individual unit.

It is obvious that a competitive situation exists between the manufacturer and the jobber, the manufacturer and

the dealer and the jobber and the dealer. The manufacturer and jobber, owing to their greater spread, undersell the contractor-dealer. This underselling, however, is not warranted, because of the additional sales expense required to reach these small consuming units. Each contractor serving industry was also interviewed. They frankly admitted that they did not attempt to sell any particular brand of goods. They admitted being only order takers. Their reason for taking orders was that they could not afford to sell in competition with the other units and picked up orders for whatever the ultimate user desired, handling the article on a very small margin. In nearly every case the contractor indicated a desire to sell one specific article provided he could handle that article exclusively and without competition from the manufacturer and jobber in the territory that he served.

Method Used on Pacific Coast

The manufacturer and jobber say that the dealer is not loyal and will not sell, so they are compelled to make contact with the field in order to get a sufficient volume of business. If this is true it is largely the fault of the manufacturer and jobber, because on the Pacific Coast a straight-line distribution method is used and used successfully. In that territory the contractor-dealer actually sells because it is worth his while to use sales methods. He is not competing for each order with the jobber and manufacturer who serve him. The one place where direct selling is an advantage is the first group, which represents only 7½ per cent of the total number of prospects.

If it is intended that the contractor shall function as a distributing organization, he must have protection from the manufacturer and jobber, not only in price, but on the type of equipment that he is to distribute. There are enough good contractors in every community to give adequate representation to the principal manufacturers of this country. It is the manufacturers' problem to adjust their sales methods and selling organizations so that this local outlet will be developed to function properly.

Central Station-Textile Mill Interchange Power Contract

Embraced in One-Page Letter

Agreement confirms verbal understanding of arrangements for energy interchange.

Textile mill owns all electrical equipment installed on its premises, except meters and protective relays.

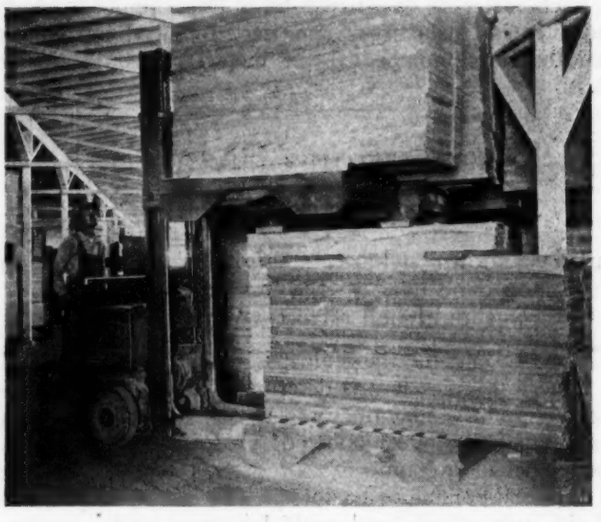
Utility company furnishes to textile mill inventory of above equipment and installed cost.

Price of energy sold by mill to utility set at 9 mills per kilowatt-hour.

Price of electricity to mill, power company's standard rate for primary power users.

Neither company agrees to furnish the other any specific amount of power, or to supply at any specific time. Object of the interconnection "to utilize the present installed capacity in generators and equipment in both companies in an economical manner."

Warehouse Capacity Increased by Electric Truck



A 2-TON industrial electric lift truck used by the Patton-Davies Lumber Company of Los Angeles is saving the labor of two men and has obviated the necessity of constructing another warehouse by increasing the capacity of the existing door-storage warehouse by 50 per cent. Forty doors are placed on a loading skid and are stored two piles high by means of the 10-ft. lift on the truck, as shown in the accompanying illustration. Formerly doors were unloaded from railroad cars and carried by hand to the warehouse and stored on end, with a resultant waste of labor and loss of storage space. The present method of storage has been utilized for some time with complete satisfaction.

Personalities and Service

AS A STEP toward assuring the public that the personal touch and friendly spirit are not lost in the complexities of a large organization, the Pacific Power & Light Company, Portland, Ore., has recently issued a booklet entitled "Personalities—A Story of Loyalty and Service," and has sent a copy to each customer and stockholder. This booklet includes primarily the photographs of all the men and women who have been with the company for ten years or longer and gives their names and positions. In a foreword Guy W. Talbot, president, referring to the seventeen years of public service rendered by the company and calling attention to the extent to which the human element controls the destiny of business, says:

"These loyal assistants, as well as our employees of shorter terms of service, are interested in accomplishing the fulfillment of their ambitions and ideals to solving such problems in our business as may arise. They can be solved by friendly co-operation and by a broader understanding, we of your problems and you of ours, with the ultimate accomplishment of the development of bigger and better communities and farming districts in which to work and play."

The High Cost of Shadows

What reduced contrasts of illumination and increased intensity did for production and working morale in one plant

By Arthur A. Brainerd
Assistant Illuminating Engineer Philadelphia Electric Company

In THE measurement and classification of illumination, as in the case of any other phenomena, it is self-evident that a mere measurement of quantity does not accurately describe the situation.

Until a very few years ago our sources of artificial light were of such low efficiency that it took all of the engineering skill available to secure enough light to perform industrial operations. Under such conditions there was, of course, no possibility of approaching anything like maximum industrial efficiency by the aid of artificial light alone. Most light sources were so feeble that glare was not a determining factor and there was little control over the other factors which, taken together, constitute a good lighting system.

With the advent of the modern gas-filled lamp, a light source was provided that is efficient and contains all of the primary colors. However, the brilliancy of the new light is so high that it produces severe glare conditions and harsh shadows. With this light it is possible to equal and often improve upon the best daylight conditions, but in most cases some of the added quantity must be sacrificed to improve the quality of the illumination.

A striking example of the importance of quality in industrial lighting is afforded in the plant of the John Sidebotham Mills, Philadelphia, manufacturer of high-grade tape for insulating purposes.

The particular operation under investigation was that of weaving. The looms used for this purpose were usually about 19 ft. long, placed back to back in pairs. Each loom has from 50 to 72 shuttles, so that each operator was weaving from 100 to 144 rolls of tape. The warp on each width of tape usually consisted of from 30 to 100 ends of threads. The work of the operator consisted, first, in tying in the ends of warp already in the loom to the ends of a new spool; second, in winding and threading the bobbins in the shuttles which carry the filling; third, in detecting broken ends, stopping the looms, threading the broken ends through the reeds and heddles and tying in the breaks as quickly as possible. A brief study of Figs. 1 and 2 will give a fair idea of the operations.

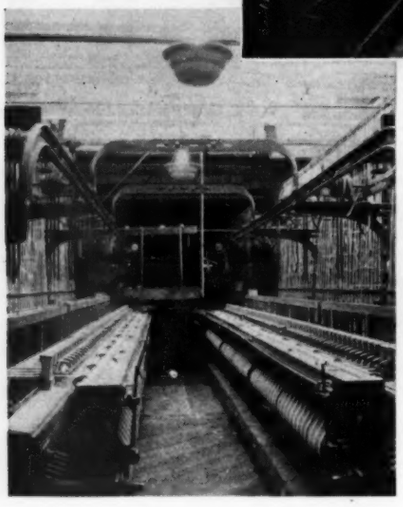
FIGS. 1 AND 2—PARTS AROUND TAPE LOOM THAT NEED ADEQUATE ILLUMINATION
1. Finished tape. 2. Bobbin for filling. 3. Shuttle. 4. Loom harness (heddles.)
5. Warp. 6. Reeds. 7. Spool of yarn for warp. 8. Tension spools.

A careful study of the preceding statements will show that as long as the machine is running at a given speed tape will be made at the same rate, even though the room is in total darkness. Records showed that a complete cycle of operations consumed on an average of six weeks. Of this time, from one to three days was spent in tying in ends. The remainder of the time the looms were run-

ning constantly, except when they were stopped to recover broken ends or rethread bobbins.

Since the looms were running from 58 to 70 per cent of the time, it was quite evident that good lighting, in order to show any appreciable increase in production, must show a remarkable increase in speed of vision.

The room under consideration had about a 12-ft. ceiling, which was flat and perfectly white. On account of the small window area and the height of the looms the natural illumination was practically negligible. The original system of illumination consisted of two 75-watt bare lamps on drop cords, spaced about 8 ft. apart and 8 ft. above the floor between each pair of looms, giving an average of about 6.5 foot-candles on the working plane. The actual usable illumination was not more than 5 foot-candles on account of the excessive shadows cast by projecting portions of the looms and parts of the operator's body. The first natural step in improving the illumination was, of course, to increase the light intensity. This was done by replacing the existing drop lights with 300-watt "glasssteel" diffusers, thus raising the average light intensity to 21 foot-candles and the usable intensity in the shadow to 2.75 foot-candles. A study of the production records under these conditions showed that notwithstanding these changes there was an actual decrease in production of about 3 per cent. This was unquestionably due to the high contrast glare.



FIGS. 3, 4, 5 AND 6—GENERAL AND CLOSE-UP VIEWS OF TAPE LOOM BEFORE AND AFTER CHANGING ILLUMINATION

Elimination of the sharp shadows indicated by the arrow in Fig. 5 increased production 7.7 per cent, although the illumination intensity was increased only 1.1 foot-candles. Later the illumination intensity was increased to 12, 20, 30 and 40 foot-candles, but no increase in output was noted above 12 per cent.

Reducing Hgh Contrasts and Increasing Intensity Raises Production 11 per Cent

Since softening of shadows was obviously necessary, the next step was to replace the "glasssteel" diffusers with four equally spaced R.L.M. domes, equipped with 100-watt bowl enameled lamps. This procedure gave an average of 14 foot-candles when installed and practically eliminated the shadows caused by the projecting parts of the looms, although heavy shadows were still cast by various parts of the operator's body. A study of production records using this arrangement showed an average increase in production of 3.85 per cent over the original installation.

The conditions under the latter arrangement, although a decided improvement, were far from satisfactory. A third arrangement was therefore adopted, which consisted in mounting 200-watt totally indirect units on the original outlets. This system, while giving an average intensity of only 7.9 foot-candles, gave a usable intensity of many times that of any other system. Since glare and harsh shadows were practically eliminated, it was no surprise when the factory records showed an actual over-all increase in production of 7.7 per cent. Since the totally indirect system was delivering illumination which was practically perfect in quality, arrangements were made to increase the illumination intensity. Tests were then run at illumination levels of 12, 20, 30 and 40 foot-candles.

A careful analysis of the records of these tests shows that at 12 foot-candles the production was increased 11 per cent, but above that value there seemed to be no justification for the use of higher intensities from the standpoint of increased production.

Increased production was not, however, the only benefit to be derived from good illumination. The particular group of machines where the test was conducted was known as the "dark looms." Sometimes weavers would quit rather than work in this section. With the change in lighting, the weavers all welcomed the opportunity of working in this section. In addition there were fewer headaches and much less spoilage of material, which would not appear in production records.

The preceding investigation represents a study cover-

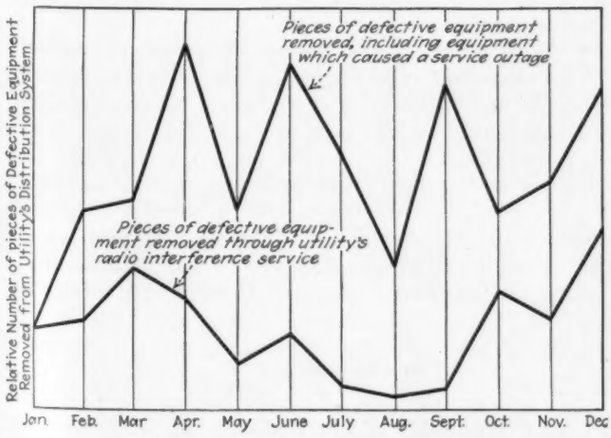
ing a period of nearly two years and was carried on jointly by the Philadelphia Electric Company and the National Research Council. It demonstrates beyond the slightest doubt that the illumination of an industrial operation is a highly complex problem. A study of the results shows that underproduction and discontent among employees were due almost entirely to harsh shadows and not to low illumination intensities. In fact, intensity of illumination may be a meaningless expression unless care is taken to insure a quality of illumination that is consistent with the character of the work performed, the value of the product and the wages of the operative.

Radio—An Aid to Improving Service*

By Laurence J. Beckwith
Milwaukee Electric Railway & Light Company, Milwaukee, Wis.

SINCE the inception of organized radio interference service by electrical utilities it has been found that there are numerous benefits that the utilities may derive by removing defective equipment from distribution or transmission systems which have been found to be a source of radio disturbance. In order that continuous and the best of regulated service be provided, it is necessary for operating equipment to be in a workable condition at all times, and it is by indicating the location of faulty equipment that the radio aids in improving electric service. Experience has shown that invariably a radio-frequency disturbance exists in the vicinity of a piece of electrical equipment for some time previous to its complete failure. This condition is particularly noticeable on equipment used with distribution voltages where radio-frequency disturbances have been known to precede the failure of a piece of equipment for as long a period as several months.

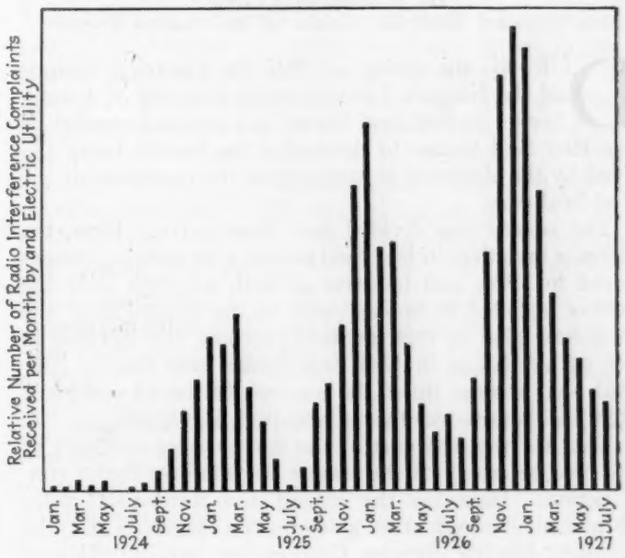
On a distribution system a loose connection may result


Relative Number of pieces of Defective Equipment Removed from Utility's Distribution System
Pieces of defective equipment removed, including equipment which caused a service outage
Pieces of defective equipment removed through utility's radio interference service
Jan. Feb. Mar Apr. May June July Aug. Sept Oct. Nov. Dec

RELATION BETWEEN TOTAL NUMBER OF DEFECTIVE EQUIPMENTS REMOVED AND NUMBER FOUND BY RADIO INTERFERENCE SERVICE IN 1926 ON ONE SYSTEM

in poor regulation of voltage; or the failure of a fuse-block, an insulator or a lightning arrester may cause interruption of service to customers with subsequent inconvenience and loss of time. It is, therefore, important as a matter of service to its customers that a utility should determine the cause of such equipment failure and prevent future service outages of similar nature. An analysis of the customer's service outage reports submitted by one utility for a period of one year indicates that more than 10 per cent of all the service outages on their distribution system were caused by defective equipment. Fuses, insulators, transformers and lightning arresters were the chief causes of nearly all of these outages.

One graph, here presented, shows the number of pieces


Relative Number of Radio Interference Complaints Received per Month by and Electric Utility
Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July Sept. Nov. Jan. Mar. May July
1924
1925
1926
1927

SEASONAL VARIATION OF RADIO INTERFERENCE COMPLAINTS

of defective equipment removed from the utility's distribution system through its radio interference service, and also the total number of pieces of defective equipment removed from the utility's distribution system inclusive of the equipment which was found to have actually caused a service outage to customers. It would appear upon a careful study of the two curves that perhaps a great number of customer service outages could have been prevented had the radio-interference service been maintained as a means of locating defective equipment during the entire year instead of only a "good will service" furnished during the radio season.

The other graph shows the relative number of complaints received by one utility for the past three years. It can be seen that, although there may be just as much radio-frequency disturbance present during the summer months, relatively very few complaints are received by the utility. Therefore, if the utility depends only on the complaints of radio interference to indicate the possible development of trouble on its distribution system, many potential sources of trouble will be overlooked.

Although to remove a defect from a distribution system before it causes a customer service outage is important, it is still more important to determine the cause for such a defect and to prevent the recurrence of similar trouble. For example: One utility experienced considerable trouble due to current leakage with a certain make of insulator. In a number of cases the wire in contact with the insulator was found to be badly corroded and would undoubtedly have broken at the first storm or added strain, causing a hazard and a service interruption. An examination of the faulty insulators indicated that the process used in making the insulators was at fault, and the use of the insulator, except on low voltages, was discontinued.

Paper to Electric Section, Wisconsin Utilities Association.

Value of Red Seal Plan to the Electrical Industry

A survey shows that there are 81.58 outlets per home. The plan influences all home electrification. Data on outlets and energy use are given

By Morris H. Lloyd
Field Secretary Electrical League of the Niagara Frontier

During the spring of 1927 the Electrical League of the Niagara Frontier made a survey of a number of its Red Seal homes and an equal number of non-Red Seal homes to determine the benefit being derived by the electrical industry from the operation of the Red Seal plan.

The survey was divided into three parts: First, the increase in outlets in Red Seal homes over ordinary homes wired in 1926, and increase of both of these over the outlets installed in homes prior to the operation of the Red Seal plan in this territory; second, the increase in use of appliances in Red Seal homes over that in non-Red Seal homes; third, the increase in use of energy in Red Seal homes over that in non-Red Seal homes.

Data for the first part of the survey were obtained by the field secretary of the league from houses under construction. Data for the second and third parts were furnished through the splendid co-operation of the Niagara Electric Service Corporation, serving Niagara Falls, and the Buffalo General Electric Company, serving Buffalo and several of the surrounding villages and towns.

Prior to the issuing of our Red Seal license a survey was made of 35 six-room houses built in 1924. These had an average of 35.5 outlets per home. A survey of 100 non-Red Seal homes built in 1926 showed the average home to have 7.4 rooms and 61.5 outlets, whereas an equal number of Red Seal homes had an average of 7.7 rooms and 81.58 outlets per house.

Results of Survey

On a basis of outlets per room, the 1926 non-Red Seal home shows an increase of 38.4 per cent over the 1924 home, whereas the 1926 Red Seal home shows an increase of 77.1 per cent over the 1924 home and 28 per cent over the 1926 non-Red Seal. Reducing the figures for the 1926 homes to the basis of a seven-room house, the Red Seal home would have 74 outlets and the non-Red Seal 58.2, leaving the Red Seal home with 15.8 outlets more. On the low figure of $2 per outlet, this means $31.60 additional business per house, or $3,160 for 100 houses. Moreover, these figures do not include the cost of service entrance. All the Red Seal house service lines had capacity to serve an electric range, whereas only 38 of the non-Red Seals were so equipped.

These data show that the influence of the Red Seal plan is improving the wiring in non-Red Seal as well as in Red Seal homes.

In obtaining the data on the use of appliances and current fourteen houses in Niagara Falls and 50 in Buffalo and vicinity were surveyed. An equal number of non-Red Seal homes similar in size, type and location were also surveyed. The Red Seal homes show a greater use of the heavy-duty appliances, although these homes have been occupied, in most cases, for a shorter length of time than the non-Red Seals. The 64 Red Seal homes have 35 ranges, 27 refrigerators and 7 ironing machines, whereas the non-Red Seals have 21 ranges, 4 refrigerators and 4 ironing machines. The fourteen Niagara Falls Red Seals have ten water heaters and the non-Red Seals four. The electric flat-iron is the only appliance

TABLE II—COMPARISON OF WIRING INSTALLATION IN HOMES WIRED PRIOR TO AND SINCE THE BEGINNING OF RED-SEAL OPERATIONS

Homes	Outlets: Ceiling Light	Wall Light	One-Way Switch	Three-Way Switch	Convenience	Special	Total
A Non-Red Seal home, 1924	12	10.5	7	0	6	0	35.5
B Non-Red Seal home, 1926	19.31	12.88	10.86	3.61	14.34	0.51	61.51
C Red Seal home, 1926	23.48	15.22	14.97	5.36	20.61	1.84	81.58

A. From survey of 35 six-room houses built prior to operation of Red Seal plan.
B. From survey of 100 houses built since Red Seal operations were started. Average of 7.44 rooms per house.
C. From survey of 100 houses built since Red Seal operations were started. Average of 7.77 rooms per house.

TABLE III—APPLIANCES IN USE

Sixty-four Red Seal homes and 64 Non-Red Seal homes on lines of the Buffalo General Electric Company and Niagara Electric Service Corporation.

Appliance	Red Seal	Non-Red Seal
Range	35 (7.85 kw. average = 295 kw.)	21 (7.45 kw. average = 156 kw.)
Tank heater	10	4
Refrigerator	27	8
Flat-iron	64	64
Vacuum cleaner	60	53
Washer	39	40
Toaster	29	34
Heater	17	22
Percolator	16	15
Ironing machine	7	4
Dishwasher	7	3
Sewing machine	1	3
Cooker	0	1
Grill	4	2
Waffle iron	8	2
Fireplace	2	0
Rectifier	1	0
Battery charger	0	1
Fan	4	0
Curler	11	5
Hair drier	1	0
Heating pad	1	0
Piano	1	0
Auto warmer	1	0
Small motors	10 (2.63 hp.)	7 (1.75 hp.)
50 Buffalo G. E. Red Seal homes	108.24 kw. lights. 2,165 watts per home	99.27 kw. lights. 1,985 watts per home

TABLE I—INCREASE OF OUTLETS IN RED SEAL HOMES OVER NON-RED SEAL HOMES WIRED IN 1926

	100 Red Seal Homes										
Outlets	Ceiling	Wall	One-Way Switch	Three-Way Switch	Convenience	Laundry	Range	Special	Total	Service	Rooms
Installed	2,348	1,522	1,497	536	2,061	107	47	40	8,158	All	777
Minimum Red Seal requirements	2,244	1,025	1,432	414	1,802	100	0	0	7,017	have range	...
Excess	104	497	65	122	259	7	47	40	1,141	capacity	...
Per cent excess required	4.63	48.40	4.54	29.50	14.40	7.00	..	..	16.25	.....	...
	100 Non-Red Seal Homes										
Outlets	Ceiling	Wall	One-Way Switch	Three-Way Switch	Convenience	Laundry	Range	Special	Total	Service	Rooms
Installed	1,931	1,288	1,086	361	1,434	29	16	6	6,151	62 per cent have	744
Minimum Red Seal requirements	1,917	1,062	1,217	397	1,616	100	0	0	6,309	small service	...
Excess	14	266	—131	—36	—182	—71	16	6	—158	38 per cent have	...
Per cent excess required	0.73	21.20	—10.75	—9.06	—11.25	—71	..	..	—2.50	range capacity	...

TABLE IV—ENERGY CONSUMPTION

	Kw.-Hr. per Month— Total	Average per Home
35 Red Seals with ranges	8,876	253.5
29 Red Seals without ranges	4,129	142.0
64 Red Seal homes	13,005	203.0
21 Non-Red Seals with ranges	4,734	225.0
43 Non-Red Seals without ranges	4,780	111.0
64 Non-Red Seal homes	9,514	148.6

Average of all homes on B.G.E. Company system is 61.2 kw.-hr. per month.
Average Red Seal with range consumes 11.5 per cent more than non-Red Seal with range.
Average Red Seal without range consumes 28 per cent more than non-Red Seal without range.
Average of all 64 Red Seals shows 36.6 per cent greater energy consumption than the 64 non-Red Seals.
Figures above do not include energy consumed by water heaters.

that can claim 100 per cent saturation in both types of houses.

Turning now to energy consumption, we find that the Red Seal homes consume a considerably larger amount than the non-Red Seals. Averaging the entire group of 64 Red Seals against the equal number of non-Red Seal homes, we find the former consumes an average of 203 kw.-hr. per month, as against 148.6 for the latter. Since water heaters are given a flat rate and are connected outside the meters, these figures do not include the energy used by that appliance.

It should be borne in mind that the non-Red Seal homes investigated for this survey are considerably above the average of all the homes on the Niagara Frontier in number of outlets, appliances used and energy consumed. However, these data show conclusively that the Red Seal plan is beginning to bring the results that its promoters have hoped for it. In a few more years, when a larger number of Red Seal homes have been built and have been occupied for a greater length of time, it will no doubt be possible to show even better results.

Electric Shovel Reduces Digging Costs

COMPARATIVE yardage costs on electric and steam shovels used by the Consumers' Rock & Gravel Company, Los Angeles, in digging sand and gravel in open quarries show remarkable savings in favor of the electric shovels. The accompanying data are for a typical month's operation on a 1¾-yd. Marion 37 electric shovel and a 1¾-yd. Bucyrus steam shovel handling practically the same tonnage. As indicated, the power cost for the electric shovel was 0.327 cent per ton as against a cost of 0.953 cent per ton for the steam shovel. Moreover, there was a labor saving of $410.87 for the month in

COMPARATIVE ELECTRIC AND STEAM SHOVEL OPERATING COSTS

	Electric	Steam
Type of shovel	Marion 37	Bucyrus 50
Capacity of bucket	1¾ yd.	1¾ yd.
Tons of material per month	47,700	46,500
Hours worked	286	318
Power cost	$155.48	.....
Oil cost at $1.20 per bbl. at shovel	.....	$393.22
Water cost at 5 cents per 100 cu.ft.	.....	50.00
Kilowatt-hours used	10,600	.....
Power cost per ton, cents	0.327	0.9535
Labor cost per hour (three men)	$2.225	$2.37
Total labor cost	$643.00	$754.00
Extra labor cleaning boiler	.....	11.70
Total operating cost	$798.45	$1,208.92
Net cost per ton, cents	1.675	2.595

ELECTRIC SHOVEL USED IN SAND AND GRAVEL QUARRY NEAR LOS ANGELES

favor of the electric shovel, making the net tonnage cost for the electric shovel 1.67 cents as compared with 2.595 cents for the steam shovel. The company now has two Marion 37 electric shovels of the motor-generator type and as a result of reduced tonnage costs all of its five shovels will eventually be electric.

Power for electric shovel operation is purchased from the serving utility at 2,300 volts, three-phase, from a metered line that parallels the gravel quarry. A bank of three 50-kva. transformers is mounted on a small car, which has standard light railroad rolling stock and is advanced every few weeks by extending the temporary track. The high-tension connection to the transformers is made with overhead service wires, and power at 440 volts is fed to the shovel by a three-conductor No. 1 rubber-insulated portable cable 500 ft. in length.

Letters from Our Readers

Mr. Greene Defends His Methods of Cost Allocation

To the Editor of the ELECTRICAL WORLD:

Charles S. Reed, in an article entitled "Veal, Hide and Byproducts," which appeared in your Aug. 27 issue, introduces an interesting story and expresses skepticism regarding the outcome of cost allocation (even though he enters the arena with a bull of his own breeding) and fears that a knowledge of fabricated costs of service will result in dire calamity to utilities. The writer believes his best reply to the story, the skepticism and the fears is to refer those who hold such ideas regarding cost analysis to the National Association of Cost Accountants' report of a talk by James H. Rand, Jr., president Remington-Rand Company, as published in the *N. A. C. A. Bulletin,* Vol. IX, No. 2, Sept. 15, 1927.

Mr. Reed says: "These other methods [peak responsibility, kilowatt-hour ratio, summations of maximum demands and the theories of Messrs. Eisenmenger and Greene] are apparently disposed of by Mr. Hills in no uncertain terms." It is a great satisfaction to the writer to have this tacit admission that Mr. Reed's and Mr. Knight's attacks on the writer's methods had been effectively answered by the writer. Mr. Hills' letter, which appeared in your Aug. 6 issue, indicates that Mr. Hills' one shot at the writer's so-called theories missed the mark.

In Mr. Reed's attack on the consumption and excess-peak responsibility method (Mr. Hills' phantom-customer method) he makes an accusation which applies not only to that method but to the Eisenmenger and Greene methods. Mr. Reed claims the methods are in error because they would allocate capacity costs on a purely kilowatt-hour basis when a system is operated at 100 per cent load factor. If such a load factor could be attained and maintained by selling capacity on a flat kilowatt-hour basis, the allocation of capacity costs by the kilowatt-hour ratios would surely be simple, ideal, accurate and equitable. Of course, such a load factor is impossible of attainment and can be only approached on generating plants. Should such a condition be brought about by offering inducement rates for off-peak business, why must the inducement rates be withdrawn as soon as a cost allocation is made? The writer contends the off-peak inducement rates should be retained and an application made of a little "common sense as a modifier."

In the writer's reply to Mr. Knight's attacks, made in an issue of the ELECTRICAL WORLD, he pointed out that capacity charges collected from the consumers to whom special off-peak rates might be given must be deducted from the total capacity costs, and such consumers' load data must be deducted from total load data before allocating the balance of the capacity costs to the other consumers. Mr. Reed evidently has in mind only costs for those consumers who are to be rendered wholly or partially off-peak service and whose loads are under control of either recording demand meters, time switches or switches operated by employees of the utility. Mr. Reed has evidently overlooked the more than 99 per cent of the consumers for whom such control is either impossible or economically impracticable.

Mr. Reed contends that a flat rate of profit on each dollar of cost must follow cost allocation, and that cost allocation would prevent a utility from charging anywhere from increment cost to what the traffic will bear. The writer contends that cost allocation and the determination of rates are two separate and distinct operations. Our experience of more than seven years with cost allocation is that: (1) Cost allocation does not compel *per se* the adoption of rates based on costs; (2) it may lead ultimately to the adoption of such rates; (3) it might result ultimately in small increased charges to each of a large number of residence consumers and to a number of power consumers, but in very few cases would such increases result in charges even approaching what the traffic can easily bear; (4) it has resulted in a reduction to those consumers to whom service was being rendered at dangerously near to what the traffic would bear; (5) it has resulted in further stabilizing our business; (6) it has not resulted in a reduction of a fair return on a fair value of our properties.

Mr. Reed has offered what he terms the weighted-peak method. He admits that it is far from perfect and that it fails to stand certain tests. Just why he should offer a method which he precondemns is a puzzle to the writer, who still claims that his methods are accurate and that they have not been successfully assailed. The weighted-peak method is not an accurate and equitable method for allocating the benefits of uncontrolled diversity because, among other reasons, it involves the peak responsibility and disregards the element of used capacity. It will allocate to a 100-per-cent-load-factor consumer a cost less than the equitable apportionment of costs of such a consumer. It is of no value for determining an off-peak rate, since the range between minimum and maximum has been fixed, independently of his method, between increment costs (prevailing rulings of utility commissions) and what the traffic will bear (competition).

Mr. Reed, I believe unintentionally, misquoted the writer in saying, "Greene expresses himself as confident that no convincing argument can be raised against his contention and those of Mr. Hills as to the allocation of capacity costs." What the writer stated was: "It is evident no convincing arguments can be raised against both Mr. Hills' and the writer's contention that 'used period capacity' costs should be allocated by the 'consumption ratios.'"

Even though the writer has assailed Mr. Reed's article and method to his own satisfaction, he appreciates the value of Mr. Reed's contribution as a clarifying medium.

Iowa Railway & Light Corporation,
Cedar Rapids, Iowa.

W. J. GREENE,
Rate Engineer.

Digest of Electrical Literature

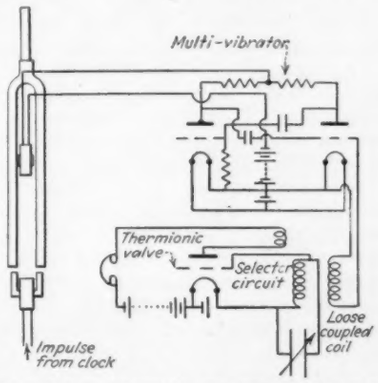
Hydro-Electric Development and Steam Equipment

Utilization of Our Coal Supplies.—J. W. COBB.—The ideal utilization of coal supplies would necessitate the complete realization of the potential thermal and chemical values of coal without the emission of smoke. Burning raw coal is an obvious failure to realize that ideal. It is stated that it need not be assumed that coal as it has been naturally deposited is in the best chemical condition for use, nor that there are no practicable means of stimulating its activity, that is, of inducing a different behavior during carbonization from that natural to the coal as it is mined and imparting, where desired, a greater utilization factor. The author has recognized, in offering evidence to support his main thesis, that the one great reason militating in practice against the replacement of the direct burning of coal by methods which would be more scientifically, economically and hygienically satisfactory is that none of the other processes of transforming coal are commensurable, in speed of combustion, with direct burning.—*Engineering (England)*, Sept. 9, 1927.

Foreign Developments.—Recent advances in foreign practice in regard to boilers and turbines as well as fuels and methods of firing are considered in this article. The exchange of electrical energy between countries and the economic relation between power produced hydraulically and that produced thermally, as developed at the World Power Conference, is reported. A record of the various papers presented at the Rome conference and an abstract of several such reports are given. These show the economies and efficiencies and practices employed in stations in England and on the Continent.—*National Electric Light Association Report*, August, 1927.

Units, Measurements and Instruments

National Physical Laboratory, Frequency Control.—For the standardization of low frequencies and telephonic frequencies a method has been devised based upon the direct harmonic production of the frequencies from the circuit given by a well-regulated clock. From the pendulum contact an electric impulse is sent through a coil having a laminated core the ends of which face the ends of the prongs of a tuning fork. The impulse is received through a Weston relay interposed between the clock contact and the coil, the latter being energized from a lamp circuit of 100 volts. The tuning-fork frequency is adjusted to 50 cycles per second within one or two parts in 10,000. A large resonant vibration is maintained, and the decay in amplitude during the 50 vibrations between successive impulses is very small. The electro-motive force induced in the iron-core bobbin between the prongs is in series with the anode current supplied to the multi-vibrator, which has an impulse frequency of 50 cycles and is synchronized by the fork. The impulses from the multi-vibrator are passed through the coil, which is loosely coupled to the selector circuit. As the selector circuit is tuned to resonance with the successive harmonic frequencies of the impulse through the coil, resonant telephonic frequencies up to 3,000 cycles per second of large amplitude occur in it. A steady frequency of 1,000 cycles for measurements may be obtained by adjustment of the selector circuit. Frequencies intermediate between the 50-cycle intervals become audible as beats, and the range may be



SCHEMATIC DIAGRAM OF CIRCUIT FOR FREQUENCY CONTROL STANDARDIZATION

extended from the audible up to radio-frequencies by multi-vibrator principles. This combination of a mechanical vibrator and an oscillating circuit under the clock control has found various applications, the accuracy being of the order of two or three parts in a million. For temperature correction a variable condenser is added in parallel with the grid winding of the fork.—*Engineering (England)*, Aug. 19, 1927.

Investigation of Conflicting Cable-Sheath Loss Formulas.—L. C. HUTCHINSON.—The use of different limits in integrating for the conductor flux in the calculation of the eddy-current loses in the bonded sheaths of single-conductor cables has produced a difference in the results obtained by investigators who have used the same formulas for this purpose, according to the author. The present research has been carried out through computation, in connection with a practical example, using an independent method with a view toward determining which formula is correct. The author has considered the conditions involved and states that there are inaccuracies connected with the use of such formulas as he has investigated.—*Journal of the Institution of Electrical Engineers (England)*, September, 1927.

Transmission, Substations and Distribution

Mechanical Characteristics of Transmission Lines.—SEIICHIRO NODA.—The author presents the results of a series of investigations on the mechanical characteristics of transmission lines and has dealt exclusively in this paper with the fundamental equations of the wire span and the special case of suspension from supports at equal elevations. Other cases will be dealt with in subsequent papers which, it is stated, are now in preparation. Theoretically correct results have been obtained by somewhat elaborate calculations, while in tables for practical work the author has not overlooked the desirability of rapid utilization characteristics. A method of testing wire spans is proposed. From an analysis of the fundamental equations of mechanical load on a wire suspension, formulas have been developed for suspension according to specific conditions. Practical problems in wire-span calculation, solutions of equations and the introduction of practical formulas characterize the paper. Graphical solutions illustrative of two different methods are given, and a separate section is devoted to the effect of suspension insulators and their position with reference to the previously utilized equations. Logarithmic tables have been carried to six places to assist in the solution of the various formulas.—*Memoirs of the Ryojun College of Engineering (Japan)*, Vol. 1, No. 1.

Aluminum Alloy Transmission Cables.—I. SCHMITT.—A comparison is given between the mechanical and electrical properties of copper wires and wires of various other metals and alloys which are being used today for electrical transmission purposes. The author has investigated the degree of usefulness and economy, taking into consideration specific weight, expansion coefficient, conductivity, mechanical strength, cost, safety factor and chemical resistivity. Some of the advantages of one type of cable are compensated by almost equivalent disadvantages, with the result that the total cost of a given line varies only between 99.5 per cent and 104.4 per cent from the cost of a copper line. It seems, however, that some of the mechanical advantages of high conductive aluminum cables exceed the cost consideration.—*Elektrotechnische Zeitschrift*, Aug. 18, 1927.

Motors and Control

Current Rushes in Induction Motors During Switching Operations and Action of Auxiliary Resistances.—H. KOCHER.—Winding defects, such as short circuits between layers or coils, occasionally occur in the stator coils of induction motors during service. In high-tension motors this defect is more frequently met and a clear conception of the cause

is sometimes lacking. It is sometimes stated that these failures result from current rushes on switching in, the electrodynamic effect on the end connection setting up mechanical stress which damages the insulation and finally causes a short circuit. Tests have been undertaken to determine the extent of the danger involved in these stresses. This article gives the results and conclusions drawn from the research work conducted with high-tension induction motors with the object of investigating the amplitude of the current caused by maintaining equilibrium after ordinary switching operation and of ascertaining the efficiency of auxiliary contacts for suppressing the current rushes. The switching-in current rush always refers to the maximum value of the current, if an alternating pressure is suddenly applied to a body possessing self-induction. Under certain circumstances the current rush on switching in can be very great and consequently have a deleterious effect upon the windings and on the protective devices against excess current. The following tests were carried out: Switching in with the rotor on open circuit, switching in with the rotor circuit closed on the starting resistance, and switching in with short-circuited rotor winding, the motor running at approximately synchronous speed. Measurements of the current rushes were made with the aid of a three-phase oscillograph. The article deals fully with these conditions for induction motors. Measurements were made upon a four-pole, three-phase motor for 140-kw., 5,000-volt, 60-cycle use with star-star connections. It is stated that usually there is no danger of injury to the winding resulting from the current rushes with values up to three times that of the normal current. Under this assumption it appears that only in exceptional cases are auxiliary resistances necessary to suppress dangerously high current rushes. *Brown, Boveri Review (Switzerland)*, September, 1927.

Heat Applications and Material Handling

Electric Resistance and Percussion Welding.—TAKESI OKAMOTO.—A differential equation expressing the temperature at any time and distance along a bar in the process of butt welding is derived and solved as an introductory step in this discussion. This equation is said to take into consideration all the factors which affect the temperature, such as the power manifested in the butt surface during the welding operation, the heat generated in the metal itself by the welding current and the metallic resistance which increases with the temperature, the heat loss from the metallic surface and similar factors. The temperature distribution and variation are calculated for one of the examples involving soft-steel bar welding, through application of the physical constants and the numerical value of the power as estimated from the oscillogram. The mechanical properties of the weld under test and the microstructure along the welded bar are, in the opinion of the author, fully accounted for in this mathematical discussion. It is stated in the latter part of the article, in which the theory of percussion welding is developed, that the heat produced between the two metallic surfaces which are to be welded in a very short time—say one hundredth of a second—is divided in the metals in proportion to the square root of the product of the thermal conductivity, the specific heat and the specific gravity. The temperature rises due to the heat flow and the melting points of the two metals determine the welding ability of the material. A description of various tests to which welded joints have been subjected and a description of the behavior of percussion-welded joints of various metallic wires which have been drawn through dies several times as a test of the welding process is given. —*Journal of the Institute of Electrical Engineers of Japan*, August, 1927.

Electrophysics, Electrochemistry and Batteries

Mechanical Forces Between Electric Currents and Saturated Magnetic Fields. —VLADIMIR KARAPETOFF.—The general case considered is that of a number of independent electric circuits placed in a medium of variable permeability and subject to saturation, in parts or as a whole. The problem is to determine the component, in a given direction, of the mechanical force acting upon one of the electric circuits, upon a group of circuits, or upon a group of circuits with part of the magnetic medium rigidly attached to them. It is believed that the problem has not been solved in this general form previously. The author has made use of the expression for the stored electromagnetic energy of the system, assuming all the electric circuits to be originally open and then closed one by one. Such a treatment necessitates a number of partial saturation curves, giving the linkages with each individual electric circuit when some of the remaining circuits are closed and the rest are open. A virtual displacement is then given to the part of the system under consideration, keeping either the linkages or the currents constant, and the mechanical forces is then determined from a comparison of the work done with the change in stored energy. The familiar reciprocal relationship for the mutual inductance which holds true in a medium without saturation can be generalized to a more involved integral expression for a saturated medium. In order to connect the general treatment with the simpler cases previously solved in the literature of the subject, some intermediate cases of one and two circuits are considered, especially those of importance in applications.—*Journal of American Institute of Electrical Engineers*, September, 1927.

Bimetallic Thermostats.—W. AUMANN.—Many types of heat-controlled apparatus utilize the bending of a bimetallic strip to release a contact or to trip a mechanical lever arrangement. The author explains the theory of these thermostats and gives a method whereby a suitable bimetallic strip can be calculated for any given temperature range and mechanical effort. Curves are given for the characteristics of a large number of strips made from various metal. Since it is difficult to maintain this characteristic constant for any pair of metals, a simple testing method is described, to check it.—*Elektrotechnische Zeitschrift*, Aug. 11, 1927.

Miscellaneous

Electrification of Agriculture in Denmark.—V. FAABORG-ANDERSEN.—A review of the history and present position of electricity on the farm in Denmark and a description of the methods by which its use has been extended and may be further developed. Denmark as an agricultural country occupies a high position and was prompt to utilize electricity and investigate the potential advantages and possibilities in the application of this form of power to farm work. It is somewhat disappointing to find that this article, whose author is secretary of the Royal Danish Electricity Commission, gives remarkably little information concerning actual utilization methods in his country. The discussion is confined to highly elementary statements of the possibilities for economy which are involved in the use of electricity. The applications which are mentioned consist of devices for sawing firewood, baling hay, conveying material, crushing oats, winnowing machinery, milking machinery and some few miscellaneous uses. Cooking and heating are said to have made little headway in Denmark owing to the comparatively high cost of electric stoves and kitchen ranges and to opposition arising from the conservatism of the Danish people. It is stated, however, that the power supply companies are soon to give concentrated consideration to this phase of energy consumption.—*Electrical Review (England)*, Aug. 19, 1927.

"Armco" Iron and Mild Steel at High Temperatures.—The results of experiments by the Department of Scientific and Industrial Research are reported in part in this exposition of various physical properties of "armco" iron and mild steel. Tensile curves, relation between strain and duration of test at various temperatures, comparison of limiting creep stresses for "armco" iron and carbon steels, impact, hardness and fatigue tests are all given. The investigator concludes that if the permanent deformation developed at the limiting creep stress is permissible, a long life may be predicted for the material under this stress. If, however, continuous creep will occur, the material must fail sooner or later. It is also asserted that for practical purposes the curves of limiting creep stress must be considered as the true ultimate strength curves, when the effect of time, at high temperatures, is to be taken into consideration. Under high temperature conditions allowance must be made for the heat to which the material will be subjected.—*Engineering (England)*, Aug. 5, 1927.

News of the Industry

Deutsch Talks of Germany

Head of A.E.G. Says that Electrical Manufacture Ranks as Third Industry in Size, Despite Socialistic Attitude of Government and High-Tariff Barriers

INDUSTRIAL conditions in Germany have improved materially during the past year and are still on the mend, according to Dr. Felix Deutsch of Berlin, head of the Allgemeine Elektrizitäts-Gesellschaft. Dr. Deutsch is on his first visit to this country, and what impresses him particularly is the immense purchasing power of the middle classes and the tremendous enterprise and initiative of private capital.

Germany, he said, has gravitated into state socialism. Time was when the Allgemeine Elektrizitäts-Gesellschaft could obtain concessions for the erection and operation of electric light and power plants, but now existing concessions will not be renewed and are taken over by the state or municipality on their expiration. The state or municipality forms a corporation to take over the system, all the common stock of which is owned by the government. In this way the political disadvantages of government operation are overcome, but with what ultimate success time alone will tell.

As an example Dr. Deutsch cited the case of the city of Berlin. Prior to 1915 the lighting system was owned and operated by the Allgemeine Elektrizitäts-Gesellschaft, which owned and designed many similar systems throughout Germany; at the expiration of the concession the city took it over, and since then his company has merely acted as a consultant and as a contractor when new work is desired. Similar situations exist in many other municipalities, and it is only where the A.E.G. still holds concessions that it also functions as an operator.

Owing to the higher wages paid in this country and to the consequently higher living standards, it is impossible to compare electrical conditions in the United States with those in Germany, according to Dr. Deutsch. Among the rank and file of Germany, electrical household labor-saving appliances are unknown, because they do not possess the wherewithal to buy them. As a result the lighting companies do not have the trade and the manufacturers the great business which these appliances bring to American central stations and to electrical manufacturers.

Naturally, said Dr. Deutsch, the Allgemeine Elektrizitäts-Gesellschaft would welcome the opportunity to manufacture hundreds of thousands of fractional-horsepower motors for these various household appliances; but for the present, with domestic help plentiful in Germany, not much of a market exists for them.

In heavy equipment the A.E.G. has plenty of work on hand, though such keen competition exists that the profits are much restricted. As a matter of fact, Dr. Deutsch said, his company has in hand at present orders for 1,000,000 kw. in steam turbines. It has just completed additions to the Klingenburg station of the city of Berlin, and inasmuch as only 30 per cent of the homes in Berlin are wired for electricity, the outlook for more business is very bright. Part of Berlin's supply of electricity is

DR. FELIX DEUTSCH

purchased from the national government's station at Golpa.

Outside of Germany, with the exception of Austria, the high tariff walls make it difficult for the A.E.G. to do business, especially in France, Italy and Spain; but in South America, and particularly in the Argentine, good markets exist for A.E.G. products. Dr. Deutsch said that from 30 to 35 per cent of his company's business is outside of Germany and that naturally artificial trade barriers affect its export trade.

In the order of their importance, the major industries of Germany rank as follows: Steel, chemicals, electrical manufactures. With the slowly increasing purchasing power of the German population these major industries are quite busy supplying the internal market, which has still some distance to go before the demand is supplied. The influx of foreign capital has greatly accelerated the demand, because the weakened economic organization of Germany, left to itself, could not hope to cope with the task for many years to come. This readiness of American capital to grant credits has had also a tremendous psychological effect, because the Germans with this evidence of American confidence before them have been inspired with a new zeal and are making every effort to apply research, science and engineering to effect greater economic, industrial and social progress. While government has entered business in Germany business has also manifested itself in government. The state guides and assists instead of retarding industrial activities, and whether or not such a union will prove more advantageous than the system which obtains in the United States time only can tell.

Shiba Tells Plans for World Engineering Congress

American co-operation is essential for the success of the World Engineering Congress to be held in Tokyo in 1929, according to a statement made by Baron Shiba on Oct. 7 at a luncheon given in his honor. More than sixty prominent men—including consulting engineers, industrial and utility executives and officers of national engineering societies—attended the luncheon, which was held at the University Club, New York City. Elmer A. Sperry presided and J. W. Lieb was toastmaster. Baron Shiba, as official representative of fourteen Japanese technical societies, reported progress in the preparations for the congress and received formal assurances of American assistance. Engineering standardization, he pointed out, must be conducted on an international basis to facilitate commerce and promote world industry.

The preliminary program of the congress calls for conferences under the following general headings: General problems (education, administration, standardization, international co-operation), engineering science, public works, communication and transportation, power, architecture and structural engineering, mechanical and electrical engineering, chemical industries, textile industries, aëronautical and automotive engineering, mining and metallurgy, engineering materials, fuels and combustion, scientific management, waterworks, drainage, heating, ventilation and refrigeration. Inquiries should be addressed to Baron K. Furuichi, Marunouchi Building, Tokyo.

Canadian Cabinet in No Hurry Over St. Lawrence

Ottawa advices are that the St. Lawrence power and navigation project will be dealt with by the Canadian Cabinet some time before the end of

October. Reasons that are political as well as economic have always suggested a cautious and leisurely treatment of the subject at Ottawa and, regardless of any desire at Washington that the work get under way as soon as possible, there is little prospect of the Canadian government exhibiting any hurry. The initial step proposed at Ottawa is to refer the matter to the national advisory committee created to consider it when reports on the economic and engineering aspects should be complete, as is now the case. Premier Mackenzie King recently assumed the chairmanship of this committee. In official circles in Ottawa it is considered that the appendices to the report of the joint international board of engineers have considerably narrowed the breach of opinion which existed with respect to the single-stage and double-stage proposals for power development.

Addressing the Canadian Club of Toronto on Oct. 3, William Phillips, United States Ambassador to Canada, said that the primary interest of the United States government in fostering the St. Lawrence waterway scheme was the development of navigation. It was interested in the development of power only in so far as that development would help to reduce the cost of the project, Mr. Phillips said.

New Susquehanna Project

Pennsylvania Water & Power Company Seeks Incorporation of subsidiary to Build Large Hydro Plant Above That at Holtwood

APPLICATION has been made at Harrisburg, Pa., by the Pennsylvania Water & Power Company for incorporation papers for two new companies—the Chaunceford Water Power Company and the Safe Harbor Water Power Company. The announced purpose of the movement is to build a hydro-electric power plant on the Susquehanna River above the Conowingo plant of the Philadelphia Electric Company and also above the Holtwood dam of the Pennsylvania Water & Power Company. The fall of the Susquehanna River between Columbia, Pa., and the upper end of the pool formed by the Holtwood dam is to be utilized. Newspaper estimates of the cost of the development put it at $30,000,000.

The site of the projected development includes a part of Manor Township in Lancaster County and a part of Chaunceford Township in York County. Under the laws of Pennsylvania there must be separate incorporation for each township; but if the applications are granted, the new companies will be merged, if possible, under the name of the Safe Harbor Water Power Company, and application for a certificate of convenience will then be made to the Public Service Commission.

Rumors of co-operation with the Conowingo interests to bring about combined hydro and steam development in the Atlantic Coast States affected are denied.

Lake Placid Draws Utility Executives

Taxation, Capitalization, Rural Policy, Industrial Councils, National Problems and Public Relations Are Main Themes of Empire State Meeting

AN UNUSUALLY good program attracted three hundred men, mostly executives and department heads, to the twenty-third annual convention of the Empire State Gas and Electric Association at Lake Placid, N. Y., Oct. 6 and 7. The two half-day sessions were conducted with such snap and zest and the addresses were on such timely topics and so interestingly presented that even the lure of golf did not detract from the attendance at business sessions. Corporate taxation, farm service policy, utility financing from the commission viewpoint, the problems raised by hydraulic developments involving national or international participation, combating insect pests with electric lighting traps and the value of co-operative industrial councils were among the subjects discussed.

President H. M. Brundage's major theme was the necessity of revising corporation taxes, but he touched on the increasing consolidation of companies, the impairment of the lumber industry and water power by the state acquisition of timber lands, the diminishing line of demarcation between capital and labor, and the importance of carrying the utility message to the public, a work, he said, in which the executives of the companies and the women employed by them have both responsible parts to play. Mr. Brundage's address is printed in abstract on page 811 of this issue.

The farm service policy committee, of which C. S. Ruffner is chairman, presented its report of progress and the problems ahead. On Jan. 1, 1927, there were in New York 11,000 miles of farm line, an increase of 16 per cent; an investment of $23,000,000, an increase of 15 per cent, and a 40 per cent increase in kilowatt-hour sales with a 19 per cent increase in revenue. Thirteen light and power companies filed special farm rates in one year. Ten have established rural service departments. If all the lines had been built under present conditions, the average use of 660 kw.-hr. per customer would net 7½ per cent return on the investment. The load has been developed with apparatus already on the market. By increasing the number of practical uses, adapting equipment thereto and convincing farmers of its value through salesmen familiar with their problems, a yearly consumption of 1,000 kw.-hr. to 2,000 kw.-hr. per customer may be expected, it was prophesied. In general the utilities finance the farm lines but require a customer guarantee of minimum revenue. It was recommended that farm rates be simple and embody an inducement feature.

A commission viewpoint on utility financing was expressed by Walter Fitzpatrick, chief of accounting division, New York Public Service Commission. His address is printed in part on page 785 of this issue.

Paul S. Clapp, managing director N.E.L.A., alluding to the Boulder Dam and Muscle Shoals controversies, said that while these may seem remote to persons geographically distant, any federal policies adopted in their cases may be followed generally. Where there are concurrent developments, he said, a policy must be established regarding the dividing line between government and private enterprise. Aside from settling these policies, the public needs enlightenment on many points—for example, the comparative cost of hydro and steam power and the cost of delivery.

E. H. Rosenquest, chairman of the New York State Committee on Public Utility Information, said that publicity in newspapers has increased 3 per cent and that more newspapers are using the material. Frank W. Smith, chairman of the public speaking committee, outlined a very comprehensive state-wide organization for public speaking composed of ten districts with district committees.

An interesting report on methods of combating insect pests with electric light was made by Prof. P. J. Parrott, chief of research, division of entomology, New York State Agricultural College. It suggested a new and extensive field for night lighting on farms. The speaker emphasized the weaknesses of chemical protection and expressed great hope for effective results from the use of lighting as a trap. Studies of the effect of lights of different color were reported.

Samuel Ferguson, president of the Hartford Electric Light Company, explained the nature and functioning of the New England Council, saying that the decisions of this general business body regarding power problems bear more weight than if they came from a utility group.

George B. Cortelyou, president Consolidated Gas Company, New York City, and chairman of the Joint Committee of National Utility Associations, declared that there is a tendency to deal with the superficial attributes of public relations rather than a desire to go deeper and investigate the influences that work adversely to utility corporations. Every executive should ask himself whether the service his company is rendering is as good as it would be under competitive conditions. If not, he said, the level of service must be raised and made so uniformly excellent that the stigma of monopoly will be offset.

New officers were elected as follows: President, H. O. Palmer, Empire Gas & Electric Company, Geneva; first vice-president, Charles F. Ruffner, Mohawk Hudson Power Corporation; second vice-president, William J. Welsh; treasurer, Samuel G. Rhodes. The next meeting of the Empire State association will be held at the Saranac Inn in the Adirondack district.

Controlling Machinery by Means of Sound

New "Televocal" System Demonstrated by the Westinghouse Company Directs Operation Through the Use of an Ordinary Telephone

THE "televocal" system for automatic operation of distant machinery was demonstrated this week by R. J. Wensley of the switchboard engineering department of the Westinghouse Electric & Manufacturing Company at the company's offices in New York. The system uses the ordinary telephone line and is based on the operation of relays by sound signals. A small box and a standard desk telephone make up the dispatcher's equipment. On the face of the box are three push-buttons, and above is a small loud speaker pointing at the transmitter of the telephone.

If it is desired to bring into service a certain machine in an unattended station, the dispatcher picks up the receiver of his telephone and calls the number of the desired station in the usual manner. After the exchange connection is completed the distant bell rings. A ringing relay calls into action the substation equipment, which lifts the receiver of the telephone just enough to signal the operator that the called party has answered. A buzzer at the substation is caused to transmit a code signal which the dispatcher hears and interprets to mean that the desired station is now connected. He then pushes one of the three buttons in such manner as to transmit a series of tuning-fork notes each of which causes the selector switch to step one notch when picked up by the electric ear. The substation then sends a code of buzzer signals advising the dispatcher of the number of the device selected. This is to avoid errors should the dispatcher inadvertently send the wrong signal or should the equipment fail to make the selection indicated by him. A touch on the second of the three push-buttons sends out a different note.

The sensitive electrical ear will detect the difference in pitch and route the signal to a different relay which closes the operating circuit and brings into action the machine previously selected. The buzzer answering signal then changes in character, thus advising the dispatcher that the desired result has been accomplished. The pressing of a third button dismisses the apparatus from active duty. The receiver is dropped into place, the local control circuits are disconnected, and the whole device is left in position to be called into service instantly by the ringing of the telephone bell. Should the bell ring as a result of a wrong number call, the device will answer as though called by the dispatcher, but after a few seconds will hang up because no audible note of the proper frequency has been transmitted.

Once the first note is received, the device is locked in the operating position until the final release is given by the third tone. This prevents the leaving of the control equipment in an inoperative condition after a wrong number call. The telephones are not altered in any way and may be used for ordinary conversation at any time when not in actual use for control purposes. No electrical connections are made to the telephone circuit.

I. E. S. Convention Beats Records

Five Hundred Illuminating Engineers Assemble for Four-Day Meeting in Chicago with Full and Varied Program Covering Many Phases of Their Art

WITH a registration of nearly five hundred members and guests, the twenty-first annual convention of the Illuminating Engineering Society at the Edgewater Beach Hotel, Chicago, this week was the largest in its history. Full attendance and much interest in the first two day's sessions indicated the growing importance of illumination problems. John F. Gilchrist, vice-president Commonwealth Edison Company, in welcoming the delegates on Tuesday, paid tribute to the work of illuminating engineers, which has made possible more complete enjoyment and appreciation of natural beauty and art. On the commercial side and from the central-station companies' standpoint he pointed out that illumination properly applied means increased business through lighting service to homes, shops, streets and public parks.

President H. H. Higbie in his address called attention to the steps taken to obtain wider dissemination of lighting knowledge through public utility information bureaus and by contact between the Illuminating Engineering Society and technical schools, colleges and universities. It is the obligation of lighting specialists, he declared, to arouse in the public mind proper appreciation of adequate illumination, at the same time protecting the public against fraud or misrepresentation characterizing alleged lighting discoveries and inventions. President Higbie recommended immediate revision of the lighting code for workplaces, with further revision at least every five years, and spoke for a simplified code for factory lighting inspectors to bring about greater recognition of illumination as a factor in safety problems.

The program called for a full schedule at each session, and the papers presented contained a vast amount of interesting and valuable information. The report of the committee on street lighting, presented by F. C. Caldwell, embodied a comprehensive study and appraisal of street-lighting conditions in various places. This committee has formulated a statement of principles of street lighting which has been adopted tentatively subject to revision. An important finding was the pronouncement that no street-lighting conditions prevail which justify the use of lamps smaller than 1,000 lumens and that 2,500 lumens is the smallest size of lamp which may be used with good economy.

Asymmetric light distribution requirements for side-mounted street-lighting units were presented in a paper by Arthur J. Sweet and Thomas W. Rolph in which two types of distribution were recommended as sufficient to meet present needs. In a paper on the spectral characteristics of light sources and window materials used in therapy, W. W. Coblenz discussed various sources of thermal radiant energy used in phototherapy and newly developed glass windows for transmitting short-wave-length ultra-violet radiation.

Norman Macbeth explained the color temperature classification of natural and artificial illuminants and demonstrated color measurements on about thirty glasses for use with gas-filled tungsten-filament lamps showing various colors of light qualities for particular color work. Mr. Macbeth also made a plea for truth in advertising artificial daylighting equipment.

The illumination of the Natural Bridge of Virginia by varying color floodlighting was described by Samuel G. Hibben, who pointed out that the investment of about $15,000 to make the installation had materially enhanced the value of the property as a scenic attraction. Discussing the technique of economic studies of lighting in industry, J. W. Barker called attention to the general effect of increased production resulting from better lighting but pointed out that great care must be taken in control of tests if true results are to be obtained. Improved designs for stage-lighting equipment to meet the demand for higher-intensity illuminations were described by W. C. Brown. A symposium on office lighting directed by G. H. Stickney embraced the characteristics of several classes of equipment and application, including indirect light, described by J. L. Stair; inclosed semi-indirect light by A. F. Wakefield, prismatic semi-indirect by Davis H. Tuck, open-type semi-indirect by G. R. Burton, and inclosing-globe lighting by C. A. Stone.

Wednesday evening's session included a demonstration of a rating scheme for residence luminaires by Ward Harrison based on the specifications of the I.E.S. and the Association of Edison Illuminating Companies for residential lighting equipment. The use of light for ornamentation in the home was described by A. L. Powell, together with an exhibit of attractive French light ornaments utilizing a small new lamp recently developed for this purpose. A method of adopting period and classic art designs to modern illuminants was presented by M. Luckiesh, and decorative requirements in home lighting were the subject of address by G. Hubbard Thompson.

A Common Ground on Radio Hard to Find

Conflict Between American Plan of Private Operation and European Practice of Government Control Is Manifest at Washington Conference

DIFFICULTIES in the way of adopting international regulations that would apply alike to the American system of private radio operation and the international government control advocated by European nations revealed themselves at an early stage of the International Conference on Radiotelegraphy now being held at Washington. Addressing the committee on the proposed agreement, Judge Stephen B. Davis, vice-chairman of the conference, warned it that the United States government would not accept a convention which would force the modification of the fundamental American policy of private radio control.

On behalf of the American delegation it was indicated, however, that this opposition would not apply to certain fundamental regulatory provisions "which appear to be in the general public interest." These provisions were not specifically enumerated, although it was explained that they included those questions "in which international uniformity is necessary," such as the regulation of the S O S calling waves in such a way that it will henceforth be possible for a ship, wherever it may be, to get in touch with the shore stations.

Official support of the American position was extended by the Canadian and Dutch governmental delegations and by the representatives of private interests in all countries. There is also some indication that the representatives of the French government are inclined to look with a degree of sympathy on the battle waged by the United States for the protection of private control. But in the other major European delegations, including the British, the Italian and the German, and among the Latin-American and among certain important Far Eastern representations there is understood to be distinct hostility to the American idea. To bring about a compromise between views so widely opposed will be a formidable task.

Grants Diablo License

Federal Power Commission Authorizes Next Step in Seattle's Power Plans—Permit Asked for 60,000-Hp. Plant on Wenatchee River

A LICENSE covering the Diablo site in the Skagit River, where Seattle wishes to build a hydro-electric dam, was authorized at a meeting of the Federal Power Commission on Oct. 10. The license requires the immediate installation of equipment equaling in rating half the ultimate capacity of the site. As predicted, however, the commission refused to grant licenses at this time covering the further development of the river between the Diablo site and the Canadian border, it being thought best to withhold these licenses until it becomes evident that the city will require the additional power.

The Cascade Power Company of Seattle has applied to the commission for a preliminary permit covering a project on the Wenatchee River near Leavenworth, Wash. It is proposed to build one dam 3 miles below the outlet of Wenatchee Lake and another dam 2 miles west of Leavenworth. The power is to be used for public utility purposes. It is planned to store 200,000 acre-feet in the lake. The plan is expected to make available 60,000 hp. of primary capacity.

A license covering the complete development of Phelps and James Creeks in Chelan County, Wash., was authorized for the Royal Development Company of Montana. The company is now operating on James Creek under the terms of a minor license, but the 2,500-hp. development on Phelps Creek was merged with the James Creek site in the new license. The Western States Utilities Company of Delaware was granted a license covering a 275-hp. partly constructed development on Birch Creek, in Bennett County, Idaho. A license was granted to the Gold Basis Mining & Milling Company of California covering a 290-hp. project on a small tributary of the North Fork of the Yuba River in Sierra County, Cal.

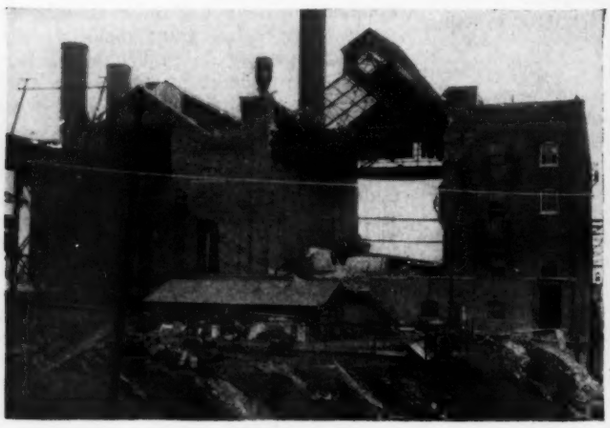
A preliminary permit was authorized for the Eastern Oregon Light & Power Company of Baker, Ore., covering a 4,500-hp. project on the Grand Ronde River, a tributary of Snake River in Wallowa County, Ore. A permit also was authorized for James G. Dehy covering a 300-hp. development on Cottonwood and Lone Tree Creeks in Mono County, Cal.

The commission declined to take jurisdiction of a small project on a stream near the outlet of Squa Pan Lake in Aroostook County, Maine. The application was submitted by the Gould Electric Company. The request of Stephen E. Keiffer for an extension of eighteen months in the period of his preliminary permit covering a project on the Cosumnes River, Cal., was granted.

The existing license of the Utah Power & Light Company covering its Soda development was amended so as to include the Mink and Lava units. The proposed Lava unit is to have an installation of 19,000 hp. and the Mink unit an installation of 30,000 hp.

J. M. De Coster, Lawrence Poitevin and Steve Meikle of Idaho Falls have applied for a preliminary permit covering a 9,000-hp. project on Palisade Creek in Bonnersville County, Idaho. Jacob Marty, Sr., of Broadhead, Wis., has applied for a license covering a 500-hp. project on Spruce Creek in southeastern Alaska, near Juneau. The power is to be used for mining purposes.

Venice (Ill.) Power Station Furnishes a Target for Tornado



WHEN the tornado which struck St. Louis and Illinois towns across the Mississippi on Sept. 29 had passed, the most striking evidence of its visit, so far as the electrical industry was concerned, was at Venice, Ill., where the power station of the Union Electric Light & Power Company of Illinois was badly wrecked. The ELECTRICAL WORLD told of the damage last week (page 751).

On the left-hand side there is shown above a view of the power house just after the storm and on the right a view of the turbine room looking west. The pictures are supplied through the courtesy of the Union Electric Light & Power Company.

Transmission in Oklahoma

Extensions of Large Systems Go on Actively — New Interconnections Made — Reports from Insull and Byllesby Companies

ACTIVITY has long marked transmission-line construction in Oklahoma, and it does not show any sign of abatement. The extensive building program being carried out by the Southwestern Light & Power Company for the western and southwestern districts of the state includes a 66,000-volt line, 42½ miles long, from Weatherford to Anadarko, and a similar line westward from Weatherford to Glinton, 17 miles; 11 miles of 33,000-volt line from Clinton to Bessie to tie in the former Chickasha Gas & Electric Company properties with the main system, and 25 miles of 66,000-volt line from Manitou and Frederick to the Red River with a steel-tower river crossing to carry it to Vernon, Tex., for a junction with the line of the Central Power & Light Company, also an Insull property. The Southwestern Light & Power Company has completed 40 miles of line from Chickasha to Lawton connecting the former Chickasha Gas & Electric Company properties with the southern section of the Southwestern Light & Power's system. Towns in the vicinity of Chickasha will receive added power from a 2,500-kw. gas-engine plant which is being constructed on the Washita River 2½ miles southeast of the city to supplement the hydro-electric plant of the company. Construction work has also begun on a 22,000-volt line from Hammon to Cheyenne and Strong City.

A new connection between its electric transmission system and that of the Public Service Company of Oklahoma is announced by the Oklahoma Gas & Electric Company, which is an H. M. Byllesby property. The two companies have contracted also for interchange of power. The new connection will make available for O. G. & E. customers energy to be generated at the new Weleetka power plant of the Public Service company. The transmission line connecting Seminole and Weleetka, it is believed, will be available about Oct. 20. The O. G. & E. company is building about 20 miles and the Public Service company about 28 miles of this connection. The Public Service Company of Oklahoma is building a belt line around Tulsa which will be fed by six substations.

The Oklahoma Gas & Electric also reports that surveys have been completed and materials are being assembled for the construction of a 63,000-volt transmission line between Drumright and Sapulpa, this being the connecting link of the line between the company's Riverbank station near Muskogee and the Horseshoe Lake station at Harrah. This connection will allow the Riverbank plant to carry a large portion of the oil field and Oklahoma City load and will also allow the Harrah plant to carry load in the vicinity of Muskogee and Fort Smith. Preliminary plans are being worked out for the installation of a 25,000-kw. turbine with necessary boilers at the Horseshoe Lake plant. This will necessitate an extension to the present building, and it is expected that this new unit will be placed in service by July 1, 1928. Interconnection of the company's lines with the system of the Kansas Gas & Electric Company has been made.

Tennessee Eastern Electric Denies Diverting Funds

In speaking of the recent order of the Tennessee Railroad and Public Utilities Commission prohibiting the Tennessee Eastern Electric Company from paying dividends upon its common stock until certain moneys which the commission ordered returned to the company's treasury have been so returned, and imposing similar conditions with respect to the making of capital additions (see ELECTRICAL WORLD for Aug. 27, page 431), W. H. Baldwin of Boston, first vice-president of the company, said to a representative of the ELECTRICAL WORLD the other day that the company's appeal will probably be heard by the Circuit Court this month. A court order, as previously reported, has acted as a stay to the recognition of the validity of the order. Mr. Baldwin declared that the company has never diverted funds, as might appear from the commission's finding and news accounts thereof, but that it has at all times proceeded according to law and in purchasing flowage rights, dam sites, etc., was acting under an order of the commission issued in 1924.

Cortelyou Tells A.E.R.A. of Utility Rights Campaign

George B. Cortelyou, president of the Consolidated Gas Company, New York, and chairman of the Joint Committee of National Utility Associations, delivered the principal address at the advisory council session of the American Electric Railway Association at Cleveland on Tuesday of last week. Speaking on "The Utility and Government," he told of the stand taken by the joint committee for private ownership and its intention to combat vigorously any governmental encroachment on the rights of utilities.

Nearly 5,800 delegates were in attendance at this, the forty-sixth convention of the railway association. President W. H. Sawyer reported an advance in two important factors—the character of service and the cost of giving service. B. C. Cobb, M. H. Aylesworth and other men well known in the electrical industry at large addressed Tuesday's sessions. The Charles A. Coffin medal for 1927, awarded to the railway which had done most to increase the advantages of electric transportation, went to the Grand Rapids (Mich.) Railway Company. R. P. Stevens of the Pennsylvania-Ohio Electric System was elected president for the ensuing term.

Purchases and Mergers

Consolidation of Southeastern Power & Light Properties in Alabama—Proposed Sale of North Birmingham Municipal Plant

FOR some time the directors of the Alabama Power Company, the Gulf Electric Company of Troy, Ala., and the Houston Power Company of Newton, Ala., have considered a plan by which the two companies last named would be consolidated with the Alabama Power Company. This plan is now being worked out and will be submitted to a meeting of the stockholders on Nov. 10. A petition to cover this consolidation is to be submitted to the Alabama Public Service Commission this month. The Gulf Electric and Houston Power companies serve a wide area in south Alabama, including the city of Mobile, and are tied into the transmission system of the Alabama Power Company. Both are Southeastern Power & Light Company subsidiaries.

The Birmingham Electric Company has offered $400,000 for the municipal electric light plant at North Birmingham, Ala. A special election will probably be called to pass on this offer.

Besides the companies named on Oct. 1 (page 703) the Harrisburg Light & Power Company is asking the Pennsylvania Public Service Commission for authority to absorb the Salford-Montgomery Power & Light Company, the Towamencin - Montgomery Power & Light Company, the Lower Salford-Montgomery Power & Light Company, the Marlborough-Montgomery Power & Light Company and the Pine Grove Township-Schuylkill County Power & Light Company.

Certificates have been filed in the office of the Secretary of State of New York merging the Sodus Gas & Electric Light Company, the Marion Power Company and the Northern Cayuga Light & Power Corporation with the Lake Ontario Power Corporation, according to previous announcement.

Petition has been filed with the New York Public Service Commission by J. Lawrence Webster, operating an electric generating and distributing system in Elizabethtown, Essex County, for permission to transfer it to the Plattsburg Gas & Electric Company.

Application of the Niagara, Lockport & Ontario Power Company to buy a franchise and electric system in the town of Oneida, N. Y., from Harley P. Phelps for $7,000 has been approved by the Public Service Commission.

Organization of the New York Power & Light Corporation, representing a merger of the Municipal Gas Company of Albany, Adirondack Power & Light Company, Troy Gas Company, Cohoes Power & Light Company and the Fulton County Gas & Electric Light Company, already reported in these columns, has been approved by the New York Public Service Commission.

The Otter Tail Power Company has bought the electric light plants at Rugby, N. D., and Rolla, N. D., previously owned respectively by the Rugby

Light & Power Company and the Rolla Mill & Power Company.

To simplify the administration of their properties in west Texas, the Insull interests, through the West Texas Utilities Company, have taken over direct control of systems of the subsidiary Central Power & Light Company at Clarendon, Memphis, Childress, Vernon, Wellington, Shamrock, Estelline and Kirkland. The West Texas Utilities now also controls directly the San Angelo Water, Light & Power Company and, as previously reported, the Quanah Light & Ice Company.

Properties recently purchased by the W. B. Foshay Company for the Public Utilities Consolidated Corporation of Delaware are the Pocatello (Idaho) Gas & Power Company and electric properties at Goodland, Kan., the latter to be operated as the Public Utilities Kansas Corporation.

The Potlatch Power Company, previously reported sold, has, it appears, been taken over by the Washington Water Power Company of Spokane, from which it purchased the energy for 40 miles of distribution lines in Idaho. The Puget Sound Power & Light Company, serving northwest Washington on Oct. 1 took over the electric and gas distributing system serving the towns of Monroe and Snohomish and the Cherry Valley district in Snohomish County under a deal closed with the Mountain States Power Company.

In recording on Oct. 1, under "Purchases and Mergers," the acquisition by the Pennsylvania Gas & Electric Company from the American Gas & Electric Company of the American Electric Power Company, the Electric Company of New Jersey was included among the subsidiaries of the American Electric Power. This was an error. The Electric Company of New Jersey was taken over in June last by the Atlantic City Electric Company and is therefore still an American Gas & Electric property.

New Jersey Public Service to Spend $14,000,000

A steel-tower transmission line erected by the Public Service Electric & Gas Company of New Jersey to connect its Kearny power plant with the new switching station at Athenia has just been put in service. The new line will permit the delivery of power from the Kearny, Essex and Marion power stations to the Passaic division and greatly increases the company's capacity in that section.

The line is to be extended from Athenia to a switching station under process of erection at Roseland and from Roseland to Metuchen, where still another switching station is being built. With the completion of the line to Metuchen 100,000 kw. additional will be placed at the disposal of industrial and domestic users. The work, including the switching stations, will cost about $14,000,000 and the new line will, it is expected, be in operation in about a year.

It is planned ultimately to build a line from Kearny through Elizabeth to the Metuchen switching station, the whole to inclose a section of New Jersey with a population of more than 1,600,000. The total length of this tower line is to be about 46 miles. Into the power circuit thus formed will be fed energy generated in adjacent company stations now in operation or to be built as well as energy received through interconnections with other systems.

The Roseland switching station, the largest in the system, will, as previously reported, occupy 40 acres and will cost between $5,000,000 and $6,000,000. Besides its function in connection with Public Service operations, it will be a part of the system that is to be built to interconnect Public Service lines with those of the Philadelphia Electric Company and the Pennsylvania Power & Light Company.

Briefer News

NEW HYDRO PLANT IN COLORADO PLANNED.—The Cross Creek Mining Company, of which George A. Gage of Buffalo, N. Y., is trustee, is planning the erection of a hydro-electric plant on Cross Creek near Red Cliff, in northwestern Colorado. The major purpose of the electric plant will be to electrify its mines and a mill to be built.

KANSAS RATE INVESTIGATION BEGINS.—Application made by the Kansas Utilities Company for a new rate schedule at Fort Scott came up before the Kansas Public Service Commission at Humboldt on Oct. 6, when a hearing preliminary to its state-wide consideration of rates was held. The general investigation will begin soon at Topeka, Judge R. M. Pickler is now chairman of the commission.

CANADIAN "SOO" ASKS FOR MORE POWER.—Negotiations for an increased power supply for Sault Ste. Marie, Ont., are being conducted with the Ontario Hydro-Electric Power Commission. Thirty thousand horsepower is available in St. Mary's River, on the Canadian side, of which 20,000 hp. is under development by the Great Lakes Power Company. The city now seeks to have the provincial commission develop in its behalf the remaining 10,000 hp. Preliminary estimates place the probable cost at $2,500,000.

MANITOBA COMPANIES APPROVE INVESTMENT OF $100,000,000.—A forward policy involving an addition of 80,000 hp. at the company's Great Falls plant has been announced by A. W. McLimont, president of the Manitoba Power Company. The additional units, Mr. McLimont says, have become necessary in view of industrial development possibilities in Manitoba. Within a few years the Manitoba Power and Winnipeg Electric companies will have invested a sum of approximately $100,000,000 in hydro development and electric properties, he asserts.

PEAT-BURNING STATION PLANNED FOR RUSSIA.—Plans are under way for a new electric power station in Leningrad, according to the Moscow *Economic Life*, as reported to the Department of Commerce. The plan is to use peat as fuel, and one project calls for a total capacity of 240,000 kw. and an initial capacity of 120,000 kw., the cost of which is estimated at 37,000,000 rubles. This is less than the estimated cost of a hydro-electric station, the capacity would be nearly double and the time of construction only half as long, says the Russian publication.

"ACTIVE-ROOM" RATE REDUCES THE CHARGES AT HUNTINGTON, IND.—September bills for electric energy at Huntington, Ind., rendered by the Northern Indiana Power Company showed a reduction of $2,000 through the use of the preliminary optional "active-room" residence rate, according to K. F. Dickinson, manager of the Huntington plant. Customers are billed both under the old straight-rate plan and the new system and are permitted to choose which bill they will pay. Petitions for a change in the method of charging in other places are awaiting the outcome at Huntington.

STATE DEVELOPMENT OF WATER POWER IN WISCONSIN.—The joint legislative interim committee on water power created by the 1927 Wisconsin Legislature began its survey of water-power projects in the state on Sept. 25. A series of meetings will be held at which testimony from representatives of power companies and the public will be

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see the ELECTRICAL WORLD for July 2, page 50.]

Rocky Mountain Division, N.E.L.A.—Broadmoor Hotel, Colorado Springs, Col., Oct. 17-20. O. A. Weller, 900 15th St., Denver.

National Association of Railroad and Utilities Commissioners — Dallas, Tex., Oct. 18-21. James B. Walker, 270 Madison Ave., New York.

American Engineering Council — Administrative Board, York, Pa., Oct. 20-21. L. W. Wallace, 26 Jackson Place, Washington, D. C.

Kansas Section, N.E.L.A. — Lamer Hotel, Salina, Kan., Oct. 20-21. H. L. Jones, 401 National Reserve Bldg., Topeka.

National Electrical Manufacturers' Association—Apparatus Division, Briarcliff, N. Y., Oct. 24-27; Radio Division, Edgewater Beach Hotel, Chicago, Nov. 28-Dec. 1. S. N. Clarkson, 420 Lexington Ave., New York.

Public Utilities Association of West Virginia—Parkersburg, W. Va., Oct. 26-27. A. B. McCrum, 514 Charleston National Bank Bldg., Charleston.

New England Central Station Association of Power Engineers—Chamber of Commerce, Boston, Nov. 2. T. D. Bond, C. H. Tenney & Co., Boston.

Electrical Supply Jobbers' Association —Book-Cadillac Hotel, Detroit, Nov. 14-18. F. Overbagh, 411 S. Clinton St., Chicago.

taken. The committee expects to spend a year in gathering data. Actual construction of several dams by the state as a part of its ten-year Horicon Marsh project, to cost $250,000, will, however, be started next year. The Railroad Commission has decided upon the site for the first dam.

LEWISTON (IDAHO) POWER PLANT TO START NOV. 1.—Initial operation of the new hydro-electric plant of the Inland Power & Light Company at Lewiston, Idaho, has been set for Nov. 1, a delay of several months having been caused by unusually high water in the Clearwater River. About 12,000 hp. will be developed by the company, it is understood.

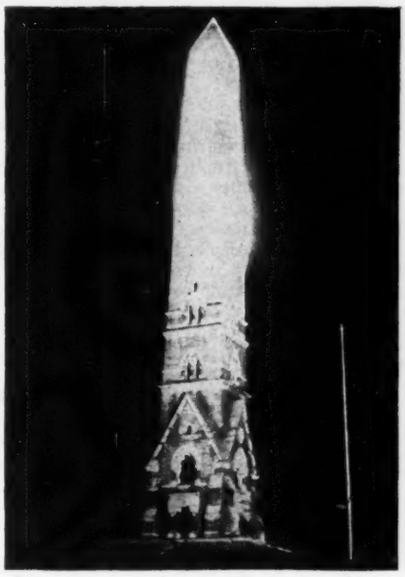
NEW YORK'S TWENTIETH ELECTRICAL SHOW OPENS ITS DOORS.—More than twenty-five thousand electrical devices and appliances were displayed on the three floors of the Grand Central Palace, New York, when the twentieth annual Electrical and Industrial Exposition opened its doors on Wednesday, Oct. 12. Two hundred thousand visitors during the ten days of the exposition were expected, Arthur Williams, its president, announced.

SYRACUSE TO HAVE TRANSMISSION BELT LINE.—With the completion of two substations now under construction, the Syracuse Lighting Company will have a belt line encircling the city for the distribution of energy. The whole system will be under the control of the Fulton Street substation. One of the substations is in the northern part of Syracuse, on Free Street, and the other is on the south side, on East Brighton Avenue. They will cost approximately $700,000.

EXPANSION IN NASHUA (N. H.) DISTRICT. — Increased loads in the Nashua (N. H.) district have made necessary the construction of a 66-kv. H-frame transmission line from Greggs Falls to Nashua, a distance of 19 miles. The line will consist mainly of 45-ft. wooden poles set in 400-ft. spacing. The conductors are to be No. 4/0 aluminum spaced for ultimate operation at 110 kv. This line will add to the reliability of service at Nashua and also furnish an outlet for surplus hydro-electric energy.

NORTH CAROLINA ELECTRICAL POWER OUTPUT INCREASES 17 PER CENT.—The electrical output from North Carolina's generating plants in 1926 amounted to 1,730,861,570 kw.-hr., an increase of 17 per cent over the previous year, according to a statement just issued by the State Department of Conservation and Development. This increase was the greatest in any Southern state except Alabama, according to Thorndyke Saville, chief hydraulic engineer of the department. The total electrical output from water only in 1926, amounting to 1,025,778,570 kw.-hr., is an increase of 11.7 per cent more than the figures of the department, but has not reached the maximum figure of 1,248,739,240 kw.-hr. of 1924.

FLOODLIGHTING OF THE SARATOGA BATTLE MONUMENT.—Arrangements to floodlight the Saratoga battle monument at Schuylerville, N. Y., for ten days beginning Sept. 29 were made by Dr. Alexander C. Flick, chairman of the state "sesqui" anniversary committee, with the General Electric Company, both searchlights and floodlights being operated by the Adirondack Power & Light Corporation. The Schuylerville monument stands on a hill 240 ft. above the river on the site of Burgoyne's intrenched camp and is itself 155 ft. high. The base is 40 ft. square, and from this a two-story Gothic plinth supports the obelisk shaft. Sixteen 18-in. incandescent General Electric searchlights in groups of four on 6-ft. platforms were installed opposite each corner of the



monument approximately 150 ft. away. In each a 1,200-watt, 12-volt lamp gave a beam candlepower of approximately 5,000,000, making an intensity of approximately 20 foot-candles on the shaft. The total installed capacity was 20 kw.

INTERCONNECTION OF TWO SYSTEMS ACCOMPLISHED IN KANSAS.—Interconnection of the lines of the Kansas Power Company (A. E. Fitkin) with those of the United Power & Light Corporation (Studebaker-Insull) is virtually accomplished by the completion of the transmission line in Kansas between Ellsworth and Frederick. With the substation at Frederick almost finished, the Ellsworth branch of the Kansas Power Company will soon be able to receive emergency service from either Hutchinson or Salina.

SUIT TO DISSOLVE LACLEDE COMPANY DISMISSED.—Suit to dissolve the Laclede Gas Light Company, with which the fate of the subsidiary Laclede Power & Light Company is entwined, on the ground that its franchise and state charter expired several years ago, was thrown out of court at St. Louis on Oct. 3, when a demurrer to the receivership action brought against the company June 28 by Charles Schlemm, a stockholder, was sustained. Mr. Schlemm contended that the company's charter had expired in 1917 and that the state had never granted an extension.

SEEKING SITES FOR LOUISVILLE-CLEVELAND BEACON LIGHTS.—Survey of the airway between Louisville and Cleveland for the purpose of selecting emergency landing fields and erecting beacon lights is to begin at once in anticipation of the opening of a Louisville-Cleveland air-mail route. Emergency fields will be located every 30 miles along the route, while beacon towers will be placed at 10-mile intervals. The lights will be automatically turned on at dusk and shut off at dawn. A similar survey has recently been made between Pasco, Wash., and Salt Lake City.

THE MENOMINEE INDIANS AND WOLF RIVER DEVELOPMENT. — The Menominee Indians have now voted to permit the Wisconsin Power & Light Company to make a preliminary survey of the Wolf River on the Keshena Indian Reservation, although they want a permit for the development of power withheld until legislation has been enacted by Congress to permit them to receive directly all the money accruing. Their original approval changed when they learned that the money would go into the Federal Indian Board fund, and in consequence the Federal Power Board recently canceled its permit for a preliminary survey.

NEW LIGHTING SYSTEM FOR LAFAYETTE, IND.—Specifications for a new city lighting system have been approved and adopted by the Lafayette (Ind.) city authorities, in accordance with a proposal submitted by the Northern Indiana Public Service Company. Under the new system the city will have 653 street lights, 193 of which will be boulevard lights, replacing the present arc lights. The boulevard equipment will consist of iron poles, topped with oval globes, with rippled glass and dome reflectors. The center of the lights will be 15 ft. above the pavement. The utility company will make the installation without cost to the city, and it will be completed in December.

BIRMINGHAM TO EXTEND STREET-LIGHTING SYSTEM.—Installation of ornamental boulevard lamps along Second and Tuscaloosa Avenues has been authorized by the City Commission of Birmingham, Ala. The system to be installed will be identical with that on First Avenue. There will be a total of 120 lamps of 300-watt capacity spaced 200 ft. apart but staggered so that there will be one every 100 ft. Additional "white way" lamps at important street intersections were also authorized. The

installation will be made by the Birmingham Electric Company and the cost borne by the city and the company. The city will also pay the company $48 a year per lamp for maintenance.

PECOS VALLEY PLANT MUST BE DOUBLED IN SIZE.—Additional contracts for supplying power for the oil fields of west Texas have been secured by the Pecos Valley Power & Light Company, and these will necessitate the doubling of the capacity of the new plant on the Pecos River, now equipped with two 6,000-kw. units.

GREAT NORTHERN ELECTRIC LOCOMOTIVE ON EXHIBITION.—What the manufacturer calls the largest motor-generator type of electric locomotive in the world, one of four being built by the General Electric Company for the Great Northern Railway for hauling passenger and freight trains through the new 8-mile tunnel piercing the Cascade Mountains, is being exhibited during October at cities along the Great Northern road. The locomotive has been so designed that speeds up to 50 miles an hour may be attained without interfering with good riding qualities. Within its cab is a traveling substation taking 11,000-volt alternating current from the overhead trolley wire and changing it to low-voltage direct current for operating the driving motors.

PUBLIC HEARING ON DEVIL'S RIVER PROJECT IN TEXAS.—A public hearing will be held by the State Board of Water Engineers in Texas on the project of the Central Texas Power Company for a series of low dams for power-producing purposes on the Devil's River in the upper border region of the state. The company's application says that it is planned to construct a dam 750 ft. long and 40 ft. high, with continuous appropriation of 550 sec.-ft. of water. The fact that the river flows through an arid region of southwest Texas where there is little use for the water for irrigation or community purposes leads to the belief that the application, pending also before the Federal Power Commission, will not be opposed. Devil's River is 70 miles long, with its head at Pecan Springs, near Juno. It empties into the Rio Grande at a point about 10 miles from Del Rio.

EGYPT TO DEVELOP POWER AT ASSUAN DAM.—The Egyptian government has decided to proceed with the development of hydro-electric power at the Assuan Dam, according to a special dispatch to the New York *Times*. Engineers who have been investigating the project for years have agreed that the production of a great amount of power during about half of the years offers no practical difficulties, but find obstacles in the wide fluctuation of the power during different periods of the year and the non-existence of power when the Nile is at its lowest. Another objection is that Assuan is situated far from industrial centers and there is no outlet for power on the spot. The present scheme provides for the construction of factories at Assuan for the manufacture of nitrogen for use in fertilizer and for using the power generated to electrify the railway northward to Luxor and eventually as far as Cairo.

Commission Rulings

UNUSED STANDBY EQUIPMENT NOT INCLUDED IN VALUATION.—In evaluating the property of the West Coast Power Company, the Washington Department of Public Works did not include an allowance for a steam plant and auxiliary standby equipment which had long been out of use and could not have been placed in working order without the expenditure of considerable money and the lapse of time. In view of the fact that the possibility of service interruption was remote, the department held the standby plant to be unnecessary.

CONSOLIDATION OF GAS COMPANY AND ELECTRIC COMPANY DISAPPROVED.—In disapproving the consolidation of the Worcester Gas Light Company with the Worcester Electric Light Company, the Massachusetts Department of Public Utilities expressed the view that the consolidation of a gas company with an electric company is not in the public interest when the present owners of the gas plant are apparently able properly to finance its operations and to place it in a condition for efficient operation, while the electric company, which is itself in good condition and well managed, "has refused to submit to the regulation of its rates made in accordance with the practice pertaining in the commonwealth for many years."

IDENTICAL RATES FOR RESIDENCE AND COMMERCIAL LIGHTING PRONOUNCED DISCRIMINATORY.—The Wisconsin Railroad Commission disapproved of the same rates being applied both to residence lighting and to commercial lighting by the Wisconsin Power & Light Company in schedules placed before the commission. The commission said that the same rates for these two classes of service were not only discriminatory between the two classes of customers but also between customers of the same class and were not in conformity with good rate-making practice. The commission, however, was of the opinion that the utility was not without justification in contending that customers with poor load factors had previously enjoyed rates inadequate to cover the cost of the service.

CONSIDERATIONS GOVERNING DETERMINATION OF RIVAL CLAIMS TO ERECT TRANSMISSION LINE. — A determination as to which of two electric companies applying for authority to construct transmission lines shall receive a certificate must be arrived at by a consideration of all facts disclosed by the record in respect to the particular lines to be constructed and the location of the proposed lines in reference to the other lines of each of the companies involved and to other proposed lines for which applications for certificates are pending, having regard to the interest both of the utility companies and of the public in the general territory of which the particular territory under consideration is a part. This was the decision of the Illinois Commerce Commission rendered when it granted in part an application of the Public Service Company of Northern Illinois for permission to construct and operate an extension of a transmission line from St. Charles to Virgil and La Fox. A cross petition was filed by the Western United Gas & Electric Company, which claimed that it was in a better position to serve the territory in dispute.

POLE-LINE COMPANIES HAVE EASEMENT ONLY.—The Nebraska State Railway Commission has ruled, in the matter of complaint of a telephone company that the cost was burdensome, that all public service companies occupying the highways with their pole lines must pay the cost of moving them to another portion of the road when necessary by reason of new construction, grading or graveling. It holds that these companies have only an easement or privilege of use and acquire no vested rights. It follows that the occupant of public lands used primarily for highway purposes is subject to whatever proprietary rights the owner desires to exercise, regardless of whether the lines were placed where designated by a public board in charge of highways.

Recent Court Decisions

RESPONSIBILITY FOR KILLING OF FISH PLACED ON POWER COMPANY.—The Tennessee Electric Power Company was found guilty of violating the fish and game laws of Tennessee by an Anderson County jury recently. The indictment grew out of a number of fish being killed in a creek in the town of Coal Creek by acid escaping from a vat in a power house which was being torn down by workmen who, the state contends, were employed by the company to raze the building. The company appealed from the verdict.

DE FOREST WINS ANOTHER JUDGMENT IN RADIO PATENT LITIGATION.—Lee De Forest was again declared the inventor of the radio feed-back circuit and oscillating audion tube in an opinion handed down last week at Philadelphia by the United States Circuit Court of Appeals, the decision marking the high point in litigation which has continued for several years. Against De Forest's claim were the United States government, which held that Alexander Meissner, a German inventor, "discovered" the feed-back circuit and audion; the Westinghouse Electric & Manufacturing Company, which supported the contention that Major Edwin H. Armstrong, a Columbia graduate, was the inventor, and the General Electric Company, in whose view the vital radio discoveries were made by Irving Langmuir. As before reported, the Court of Appeals of the District of Columbia many months ago held that De Forest was the inventor, but the government, holding assignment of Meissner's rights to patent, filed suit in the Delaware District Court for a decree in its favor and the exclusion of others from the field. That court, too, favored De Forest, and the others appealed. The opinion just handed down declares the evidence to disclose that De Forest came upon the possibilities of the use of the audion in radio on August 6, 1912, earlier than any of the other claimants, the nearest in point of time being Major Armstrong. The case will possibly be appealed to the Supreme Court of the United States.

News About Men of the Industry

W. H. Hodge Elected to a Vice-Presidency

William H. Hodge, who has been connected with the Byllesby Engineering & Management Corporation since 1910 as manager of the advertising and publicity department, has been elected a vice-president and manager of a newly created sales and advertising department with headquarters in Chicago. An early advocate of closer association between utility managers and the public served, Mr. Hodge has long been recognized in the electrical industry as one

W. H. HODGE

of its foremost students of the public relations question. He is the author of many magazine articles and pamphlets on the subject, and he has also written extensively on advertising and publicity for utility corporations.

A native of Wenona, Ill., Mr. Hodge attended the public schools of Amboy and La Salle and at rather an early age entered the employ of the La Salle *Tribune* as reporter, serving this and other papers for about two years. Following a short connection with the Illinois Central Railroad Company, he returned to the newspaper field. For four years prior to his affiliation with the Byllesby organization he was managing editor and director of *Public Service*. Since joining the Byllesby interests as manager of the advertising and publicity department, he has taken a prominent part in the development of the customer-ownership plan of financing and also in commercial activities of utility companies. The new sales and advertising department will have general charge of the development of new business and advertising at all of the Byllesby utility properties.

JOHN B. BASSETT, who has been connected with the New York office of the General Electric Company, has been named executive engineer of the New York district. With the exception of a short period during the war, Mr. Bassett has been identified with the General Electric Company for sixteen years. At first he was connected with the testing department, but subsequently was transferred to the direct-current engineering department, and more recently has been with the engineering department in New York.

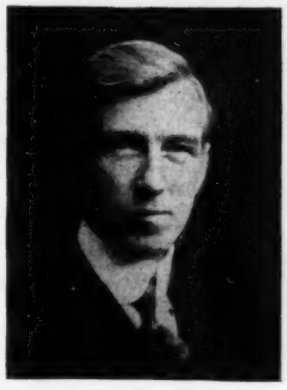
GIUSEPPE FACCIOLI, prominent electrical engineer, who has been connected with the General Electric Company at Pittsfield since 1908, has been appointed associate manager of the Pittsfield works. In the course of a distinguished engineering career in this country he has given special attention to problems connected with the development of transmission and related apparatus, including high-tension transformers, lightning arresters and other protective equipment. Mr. Faccioli has been active in the affairs of the American Institute of Electrical Engineers, having served upon some of the Institute's most important committees, on the board of directors as manager and also as a vice-president.

GORDON THOMPSON has been made assistant chief engineer at the Electrical Testing Laboratories, New York, having recently returned from China, where he spent seven years as professor of electrical engineering at Nanyang University, Shanghai. Mr. Thompson was engineer in charge of electrical laboratories at the Electrical Testing Laboratories for ten years before going to China.

DR. JOHN BOSWELL WHITEHEAD, professor of electrical engineering and dean of the School of Engineering at Johns Hopkins University, has recently returned from France, where he was serving as exchange professor in engineering and applied science during the past academic year. He visited the Universities of Aix-Marseille, Grenoble, Lyon, Bordeaux, Toulouse, Caen, Lille, Strasbourg, Nancy and Paris. In each of these universities he delivered a series of lectures on dielectric theory and insulation. In Paris the lectures were delivered at the Sorbonne and at the Ecole Supérieure d'Electricité. The complete series of nine lectures are to be published by the Société Française des Electriciens. In addition, Dr. Whitehead lectured before the Société Française des Electriciens, and he presented a paper on high-voltage insulation at the international conference on large high-tension networks in Paris in June. In the various universities visited he made a special study of educational methods in the field of electrical engineering and conferred with many educators, scientists and engineers. He also visited many laboratories, manufacturing plants and engineering installations. The University of Nancy conferred on Professor Whitehead its medal of honor.

N. Macbeth New President of Illuminating Society

Norman Macbeth, president-elect of the Illuminating Engineering Society, is president of the Macbeth Daylighting Company, Inc., and for the past ten years has specialized in the design and manufacture of equipment for the scientific reproduction of daylight. His work in this field has been that of the pioneer, a number of patents, basic, mechanical and design, covering new developments in artificial daylighting apparatus having been granted to him. Mr. Macbeth



NORMAN MACBETH

has been frequently retained by central-station electric and gas companies, by municipalities and by manufacturers of lighting apparatus to advise on technical, commercial and publicity matters pertaining to lighting, and on lighting questions he has qualified as an expert in the courts and before commissions in New York and Massachusetts. Perhaps his greatest contribution to the science of illuminating engineering is the Macbeth "illuminometer," a portable photometric equipment placed on the market in 1914 for making measurements of light and illumination.

Mr. Macbeth joined the Illuminating Engineering Society in 1906 and has served on many of its committees. During 1912-13 he was a member of the executive committee, and he was vice-president on the council, representing the New York Section, in 1911-13. He has also been chairman of the convention committee, chairman for the New York Section and chairman of the general board of examiners and was a director during 1925-27.

A. G. MACKENZIE has been appointed director of the Pennsylvania Public Service Information Committee, according to an announcement made by P. H. Gadsden, vice-president of the United Gas Improvement Company, who is chairman of the committee. Mr. MacKenzie is succeeding J. S. S. Rich-

ardson, who has become director of information for the Joint Committee of National Utility Associations. He has been associated with the Pennsylvania committee since 1925 and is thoroughly familiar with the work. He was formerly associated with Philadelphia newspapers in editorial and reportorial capacities.

T. W. Wilson, Chief Executive of Delaware Companies

Thomas W. Wilson was elected president of the Wilmington Light & Power Company, the Wilmington & Philadelphia Traction Company and of all their subsidiary power, railway and bus companies in both Delaware and Pennsylvania at a meeting of the board of directors of the companies held Sept. 29. These companies recently came under the control of Stevens & Wood, Inc., through purchase of the stock of the American Electric Power Company from the American Gas & Electric Company. Mr. Wilson, who is a graduate of Lehigh University, was for many years associated with the International Railway Company of Buffalo, when in 1912 he removed to Wilmington, Del., to become vice-president and general manager of the Wilmington & Philadelphia Traction Company. He is also a member of the board of directors of the American Electric Power Company and of its various controlled companies in Delaware and Pennsylvania.

W. H. SAWYER, president of the East St. Louis & Suburban Railway and affiliated properties, has been elected president of Stevens & Wood, Inc., succeeding in that position R. P. Stevens, who will in the future concentrate his work, as chairman of the board and executive committee, on the financial and public utility phases of the business.

MAJOR JAMES R. WERTH is now head of the power bureau of the Florida Power & Light Company at Miami. Major Werth was for some time connected with the construction division of the army and more recently was identified with the H. M. Byllesby interests and with the properties of the American Gas & Electric Company.

EDWARD H. SNIFFEN, assistant to vice-president of the Westinghouse Electric & Manufacturing Company, has transferred his office from East Pittsburgh, Pa., to New York City and is now at the Westinghouse Building, 150 Broadway. His duties are of an executive nature, assisting E. D. Kilburn, vice-president and general sales manager. Mr. Sniffen previous to assuming his present position was vice-president of the Westinghouse Machine Company. He became manager of the power department when the Machine company was absorbed by the Electric company. He is well known in the power field as one of the three men who were directly responsible for the general use of the steam turbine in the United States.

H. B. Bryans General Superintendent in Norristown

Henry B. Bryans has been appointed general superintendent in charge of engineering of the Philadelphia Suburban Counties Gas & Electric Company, the organization recently formed from the merger of the Philadelphia Suburban Gas & Electric Company and the Counties Gas & Electric Company. The appointment covers both gas and electric engineering and operations.

From 1910 to 1912 Mr. Bryans was identified with the Fulton County Gas & Electric Company, subsequently affiliating himself with the United Gas Improvement Company's Philadelphia office. He then spent thirteen years as engineer of the Schuylkill district of the Counties Gas & Electric Company at

H. B. BRYANS

Norristown in charge of gas and electric operations, but at the time of the recent merger he was serving both the Philadelphia Suburban Gas & Electric Company and the Counties Gas & Electric Company in the capacity of general superintendent. Mr. Bryans has been very active in association work, being at the present time a member of the overhead-systems committee, the electrical apparatus committee and the inductive co-ordination committee of the National Electric Light Association. He has also been prominent in the affairs of the Pennsylvania Electric Association, having been vice-chairman and chairman of the Engineering Section and chairman of the electrical apparatus committee. In addition, Mr. Bryans is a member of the American Institute of Electrical Engineers the American Society of Mechanical Engineers, the American Gas Association and the Engineers' Club of Philadelphia.

THOMAS F. PETERSON, formerly cable engineer of the Brooklyn Edison Company, has recently joined the American Steel & Wire Company in the capacity of cable engineer in the electrical and wire-rope sales department. During his connection with the Brooklyn Edison Company Mr. Peterson had been in charge of cable research and underground records, and more recently he served in the capacity of cable engineer. He is a graduate of Stanford University and has been a frequent contributor to the technical press. Mr. Peterson's new duties will be for the most part those of a cable consultant, his services being available to cable users in all problems pertaining to specifications, designs, installations, jointing and testing of cable and wire.

Dr. WILLIAM LISPENARD ROBB, dean of electrical engineering at Rensselaer Polytechnic Institute, Troy, N. Y., has been awarded a 35-year service medal by the Hartford Electric Light Company, having entered the service of the company in 1892 in an advisory capacity and continuing to perform this service.

C. T. HUNTER has been appointed manager of the Jasper district of the Alabama Power Company to succeed P. A. Terrell, who has entered the industrial division of the company.

CHARLES F. GOOB, who has been engineer in charge of the Bureau of Mechanical-Electrical Service of the Department of Public Works, Baltimore, has been appointed chief engineer of Baltimore by Mayor William F. Broening. Mr. Goob, in the new post, has charge of all the bureaus coming under the Department of Public Works. The Mayor has not appointed any one as yet to fill the vacancy caused by Mr. Goob's appointment. Mr. Goob first became connected with the municipal government in 1919, when he was appointed chief engineer of the now extinct Electrical Commission. Later he served as highways engineer, and when the Department of Public Works was created he was named to head the Bureau of Mechanical-Electrical Service.

K. M. IRWIN, who has been affiliated with the United Gas Improvement Company for the past eight years, has been appointed mechanical engineer of the electrical department of the company. Mr. Irwin, following graduation from the Sheffield Scientific School of Yale University in 1915, entered the employ of the B. F. Sturtevant Company. Later he was with Stone & Webster and Perry Barker, consulting engineer, Boston. He joined the organization of the United Gas Improvement Company in 1919 as an assistant to the electrical engineer. Mr. Irwin served five years as a member of the prime movers committee of the National Electric Light Association and in 1924 was chairman of the prime movers committee of the Pennsylvania Electric Association. He is also a member of the A.S.M.E.

Obituary

JOHN L. PHILLIPS, Pacific Coast manager for the Okonite Company, died suddenly at San Francisco, Sept. 6, of a heart attack. He had been with the Okonite Company since the World War and was well known in the electrical industry on the Pacific Coast.

Financial and Statistical News

Utility Issues Recede
Few Stocks Show Gain
Utilities Lead in Financing

FOR the first time in the present market movement, power and light stocks this week fell in line with the bearish tendency of the markets at large, and reaction was general. Losses were small in most cases, but the trend is unmistakable. This applies mainly to common stocks, but many of the preferred issues have receded slightly as well. As is invariably the case, the utilities have given less ground under pressure than most other sections of the market. The few exceptional stocks which showed gains for the week include Brooklyn Edison, Commonwealth Edison and Public Service Corporation of New Jersey.

New issues of considerable importance continue to come forward under the favorable market conditions now existing. Public utilities have taken first place among the groups in financing this year so far. According to figures issued by Pynchon & Company, the utilities have absorbed about $1,200,000,000, or 23 per cent of a total of $5,113,192,000, during the first nine months of the year. For the same period the power and light companies raised $1,047,516,200, according to data compiled by the ELECTRICAL WORLD.

Worcester's Extra Dividend

The Worcester Electric Light Company declared an extra dividend of $1.50 per share Oct. 1, or 6 per cent on the $25 par value of the stock now outstanding. The above action places the company on a 22 per cent basis for the current year. Dividends at this rate have been paid for several years prior to 1926, when a 30 per cent extra was declared on the $25 par basis. President R. W. Rollins of the Worcester company said that the extra dividend declared was paid out of earnings made previously to the rate decision of the Massachusetts Department of Public Utilities reducing the price of electricity from 7 to 5 cents per kilowatt-hour. The company has obtained an injunction against the decision, and the case is pending in the federal court at Boston.

New Utility Financing

During the week ended Oct. 13 the Philadelphia Electric Company issued first lien and refunding mortgage gold bonds to the amount of $35,000,000, the price being 98½ and interest to yield over 4.58 per cent. Proceeds of these 4½ per cent bonds, due in 1967, will reimburse the company in part for expenditures in retiring Dec. 1 bonds and for additions and improvements to properties.

First mortgage 6 per cent gold bonds of the Public Utilities Consolidated Corporation (Arizona) were offered to the amount of $1,250,000 at 100 and interest, to yield 6 per cent. Entire proceeds will be used in the acquisition of properties.

The Kansas City Power & Light Company issued 20,000 shares of first preferred stock, series B, the price being $104½ per share flat, to yield about 5.74 per cent. The proceeds of this issue will be used to reimburse the company for the cost of new generating units and other permanent improvements, additions and betterments heretofore made.

Barstow & Company Finance to Broaden Activities

In accordance with a general plan of expansion, W. S. Barstow & Company and the W. S. Barstow Management Association are being acquired by a new company under Delaware charter, W. S. Barstow & Company. It has been announced that the proceeds of an issue of $4,000,000 of 6 per cent sinking-fund debenture bonds will be used to acquire the assets of the two companies named. It is understood that no change in management or personnel is contemplated.

Drastic Need for Tax Revision

New York State Taxes on Utilities Called "Complicated Hodgepodge" by Davenport Committee on Taxation and Retrenchment

BY HENRY M. BRUNDAGE
President Empire State Gas and Electric Association

While the utility companies have never shirked their share of the tax burden, they would welcome a simplification of the present complex system, said Mr. Brundage at the twenty-third annual convention of the Empire State Gas and Electric Association, held at Lake Placid, N. Y., last week. His discussion of the tax situation is here reproduced.

TAXES against the gas and electric companies of the state during the present calendar year will amount, it is estimated, to thirty-four million dollars. That is approximately a dime from each dollar received in payment for service by the utilities. In numerous instances the taxes paid by individual companies amount to far more than this proportion. Chairman Green of the House ways and means committee is reported to have said that the federal tax on corporations ought to be reduced at the next session of Congress, "as corporations never have received the reductions which have been granted to all other lines." As a matter of fact, corporation taxes were increased by recent amendments from 12½ per cent to 13 per cent, effective in 1925, and 13½ per cent, effective in 1926. At the same time, Congress repealed the capital-stock tax, under the impression that the loss in revenues expected to result from the repeal would balance the increase in the income tax rate adopted at the time, but the net result of the 1925 amendments has been an increase in federal taxes.

Taking the nation as a whole, between 30 and 40 per cent of the taxes imposed on gas and electric corporations is for federal taxes. In the long run, the burden of corporate taxation is shifted to the customer. The corporation becomes a tax collector, relieving the state from some part of the odium attached to that necessary but disagreeable function of government and allowing popular indignation for charging what are supposed to be extortionate rates to expend itself on the corporation. Fortunately, the public has become educated in taxation during the last decade. It begins to understand that it pays indirect taxes; it will appreciate the relief which will come from any reduction in the corporate tax rate, and it will be a real relief to every person who buys a part of the corporate output and who avails himself of corporate services. It would be an even greater relief to customers than to shareholders. A plan to reduce corporate taxes so as to benefit not only a multitude of shareholders but also to reduce the cost of living to the whole body of voters, whether they be direct taxpayers or not, is one which should appeal forcibly to the next Congress.

Just a word as to state taxes. The State of New York imposes on gas and electrical corporations a general property tax, a special franchise tax, a gross earnings tax and a tax on dividends. The general property tax and the special franchise tax, taken together, are about 90 per cent of the total. The Davenport committee on taxation and retrenchment expressed the opinion of its members as to the New York State tax laws with entire frankness. It said:

"The present taxes on public utilities are a complicated hodgepodge which are the despair of the taxpayer and the amazement and scorn of students of taxation generally."

Though this report was made in 1922, nothing has as yet been done about it.

Possibly nothing will be done. There appears to be no popular demand for a radical revision. The subject is too complex for the voters to understand. Perhaps the same may be said of legislators. The system of taxation in this state is of historical growth. It contains provisions which may have had their uses, but which can be understood, if at all, only by a reference to the past. In the early days the only forms of property which had much importance were real estate and slaves. Taxes were imposed on real estate—probably on slaves also, I do not know. Then personal property grew in importance and became the subject of taxation. Then corporations appeared and received their share of legislative attention, and then public utilities, with special franchises to use the streets. These rights extended to streets and roads in two or more counties. They were made subject to assessment from a central source. The United States Supreme Court has classified special franchises among "incorporeal hereditaments," but this definition was not satisfactory to the taxing authorities because it was not clear to them that an "incorporeal hereditament" is real estate, and if a special franchise is personality, the corporate owner could deduct its debts from the assessed value of its special franchise to find the amount on which to compute the tax. To evade the tax completely it would only be necessary to put out a sufficient issue of bonds. The rule is otherwise as to real estate. Its assessable value is not diminished by the owner's indebtedness, and so the Legislature, in the tax law, declared special franchises, including the intangible right to occupy streets and roads, to be real estate, no matter what they really are. If you tax horses and want to tax cows also, one way to accomplish the result is to declare that cows shall be deemed to be horses. Classification, in law, had its difficulties, as is apparent from a story that is told of an English customs inspector who was confronted on the dock by a lady just returned from the West Indies with a pet turtle. After gazing at it long and reflectively, he delivered himself of his opinion as follows: "Hit ain't a dog nor a cat; hit's a hinseck and don't pay no duty." A special franchise is a "hinseck" which contributes to state revenue more largely than most of us think it should.

The utilities are not unwilling to pay their share of the necessary expenses of the state; nor does the general property tax, with all its uncertainties and inequalities, bear more heavily on us than on other taxpayers, and the special franchise tax, which is really a general property tax on tangible property in the streets and an income tax as to the balance, has not been the occasion of any general complaint or unrest among managers, stockholders or counsel of gas and electric companies. A complete revision of the state's tax system, codified by experts on lines deemed by them to be scientific, might prove to be a desirable change. Evolutionary growth is better than revolution, however peaceful.

The State of New York, like all the other states and countries of the world, is looking about for new sources of revenue. Mussolini has imposed a tax on bachelors, on the ground that it is a privilege tax. Silesia has imposed a tax on bobbed hair, for what reason I do not know, unless it is to discourage beauty parlors. So far as appears, no Congressman or member of our State Legislature has any idea of imposing new or additional taxes on the gas or

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Monday Oct. 10	Low 1927	High 1927
ABITIBI PWR. & PAPER, 4% com.—no par	138¼	83	141¼
Adirondack Pwr. & Lt.—7% pf.	110½	107	113½
Adirondack Pwr. & Lt.—8% pf.	115	112	116
Ala. Pwr., $7 cum. pf.—no par	111½	107	112½
Allis-Chalmers Mfg., 7% pf.	m111¼	109	112½
Allis-Chalmers Mfg., 6% com.	113	88	118¾
Aluminum Co. of Amer., com.	k99	67¼	105½
Aluminum Co. of Amer., 6% of.	k104½	101½	104½
Amer. & Foreign Pwr., pf. 25% pd.	m110	....	....
Amer. & Foreign Pwr., 7% pf.—no par	105¼	88¼	108
Amer. & Foreign Pwr., com.—no par	28	18½	30½
Amer. Bosch Magneto, com.—no par	24	13	26¾
Amer. Brown Boveri Elec†	9¼	5½	39¼
Amer. Brown Boveri Elec., pf. $7	47	40	98
Amer. Gas & Elec., 6% pf.—no par	104	95½	105½
Amer. Gas & Elec., com.†—no par	113¼	68¼	117½
Amer. Lt. & Trac., 6% pf.	115	63¼	117½
Amer. Lt. & Trac., new com.	k183	164¼	186
Amer. Pwr. & Lt., 6% pf.	103	97½	106½
Amer. Pwr. & Lt., com.†—no par	73¼	54	73¼
Amer. Pub. Serv., 7% pf.	a 98½	94	104
Amer. Pub. Serv., com.†	70	....	....
Amer. Pub. Utilities, 7% ptc. pf.	a 88	73	88½
Amer. Pub. Utilities, 7% pr. pf.	a 94½	92	96
Amer. Pub. Utilities, com.	k 53	65	70
Amer. States Sec., A	4¼	2¼	4½
Amer. States Sec., B	4¼	2¼	4½
Amer. Superpwr., 6% ptc pf.—25	29½	26¼	29¼
Amer. Superpwr., 6% 1st pf.	f 98½	....	....
Amer. Superpwr., Class A†—no par	40¼	27½	41¾
Amer. Superpwr., Class B†—no par	41¼	28¼	43
Amer. Wtr. Wks. & Elec., 7% pf.	m111¼	104½	111
Amer. W. W. & E., com. new—no par	68¼	46	72½
Anaconda Copper cap. $3	48	41¼	49½
Appalachian Electric Pwr., 7% pf.	105	100	105
Appalachian Elec. Pwr., com.	m 78	77	83
Arizona Pwr., 7% pf.	k 74	77	84½
Arizona Pwr., com.	m 20	....	....
Arkansas Pwr. & Lt. 7% pf.	107	101	107
Assoc. Gas & Elec., $3.50—50	51	....	....
Assoc. Gas & Elec., pf.—$6—no par	93	93	93
Assoc. G. & E., Class A, 10—no par	43	35	43½
BABCOCK & WILCOX, 7% com.	k117	113	124
Binghamton L., H. & P., $6 pf.	98	93	100
Birmingham Elec., pf.—$7—no par	107	105	109
Blackstone Valley G. & E., 6% pf.	106	103	105
Blackstone Valley Gas & Elec., 10% com.—50	137	98	154½
Blaw-Knox, com.†	f 96	95	96
Brazilian Trac., Lt. & pwr., com.†	f204	....	....
Broad River Pwr., 7% pf.	103½	97	103
Brooklyn Edison, 8% com.	182	148¼	184½
Buffalo, Niagara & East. Pwr., $1.60 pf.—25	f 25½	....	....
Buffalo, Niagara & East. Pwr. com. $1—no par	f 36½	....	....
CALIFORNIA ELEC. GENERATING, 6% pf.	98	96	99½
California Ry. & Pwr., 7% pf.	135	125	150
Carolina Pwr. & Lt., pf.—$7—no par	f109½	107	109½
Central & S.W. Util., $7 pf.—no par	a 96½	92½	97½
Central & S.W. Util., pr.ln.$7 pf.—no par	c101½	98½	104½
Central Ariz. Lt. & Pwr., 8% pf.	k 97	95	98
Central Ark. Ry. & Lt., 7% pf.	106	100	104
Central Ill. Pub. Serv., $6 pf.	a 92½	88½	95½
Central Ind. Pwr., 7% pf.	a 92	85½	95
Central Pwr. & Lt., 7% pf.	101	100½	103
Central States Elec., 7% pf.	97	93	97
Central States Elec., com.†	k30½	17½	30½
Century Elec., 6% com.	b162	114	162
Chicago Fuse Mfg., com.—$2.50 no par	a 35½	30	35½
Cincinnati Gas & Elec., 5% com.	g 99½	96½	100½
Cities Service, $6 pf—no par	f 94½	87	94½
Cities Service, pf. B—no par	f 8¼	8	8¾
Cities Service, pf. BB—no par	f 86	80½	86
Cities Service, com.—20	f 51½	40½	58¾
Cities Service, Bks. Shrs.—10	m 24½	22½	27
Clarion River Pwr., 8% pf.	95	....	....
Cleveland Elec. Illg., 6% pf.	110½	108	112
Cleveland Elec. Illg., 10% com.	322	285	330
Columbia Gas & Elec., 6% pf.	106½	99½	107½
Columbia G. & E. com. $5—no par	90½	82½	98½
Columbia Ry., Gas & Elec., 6% pf.	m 98	97	100
Columbus Elec. & Pwr., $2 com.—no par	68	....	....
Columbus Ry., Pwr. & Lt., 6% 1st pf.	104	98½	104
Columbus Ry., Pwr. & Lt., 6½% pf. B	103	96	103½
Columbus Ry., P. & L., com.—no par	102	75	105
Commonwealth Edison, 8% com.	a163	138	163
Commonwealth Pwr., 6% pf.	103½	91½	103½
Commonw'th Pwr., $2, com.—no par	74½	48½	78¾
Conn. Lt. & Pwr., 8% pf.	121	119	123
Conn. Lt. & Pwr., 7% pf.	117	112	118
Cons. Gas of N. Y., pf.	99½	93	100½
Cons. Gas of N. Y., com $5—no par.	117½	94	121½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6% pf.	k105	105	107
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6¼% pf.	e113½	110½	114½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 7% pf.	e116	112½	117
Cons. Gas, Elec. Lt. & Pwr. of Balti., 8% pf.	e127½	127	130½
Cons. Gas, Elec. Lt. & Pwr. of Balti., com. $2.50—no par	e 68½	51	71
Consolidated Pwr. & Lt., 7% pf.	105	100	106
Consumers Pwr., 6% pf.	103½	100	102
Consumers Pwr., 6 6% pf.	105½	103	105½
Continental Gas & Elec., 8% ptc. pf.	107½	103	106½
Continental Gas & Elec., 7% pr. pf.	104	100	103
Conti. G. & E. com. $4.40—no par.	250	210	225
Crocker Wheeler, com.†	k 25	30	38
Crocker Wheeler, 7% pf.	k 80	78	88
DALLAS PWR. & LT., 7% pf.	109	107	110½
Dayton Pwr. & Lt., 6% pf.	107	101	107
Detroit Edison, 8% com.	156½	133½	160½
Dubilier Condenser, com.—no par	4½	2½	5½
Duquesne Lt., 7% pf.	k 116½	114½	116¾
EASTERN NEW YORK UTIL., $7 pf.	107	102	104½
Eastern New York Util. com.	65	70	75
Eastern States Pwr., $7, com.	9	9	13
Eastern States Pwr., pf.	95	90	95
East. Tex. Elec., 7% pf.	106	106	108
Edison Elec. of Boston, $12 com.	d261	217	267
El Paso Elec., 7% pf.	109	105	107½
Elec. Bond & Share, 6% pf.	k110	105½	110¾
Elec. Bd. & Sh. Sec., com. $1—no par	f 77½	67¾	80½
Electric Household Util.†	a 13	11	15½
Elec. Investors, 6% pf.—no par	96	92	97
Elec. Investors, com.†—no par	41	32½	42½
Elec. Investors, 10% pd. receipts	m 16	....	....
Elec. Pwr. & Lt., ctfs. pf.	106½	96	106½
Elec. Pwr. & Lt., ctfs., 40% pd.	118	103¾	119
Elec. Pwr. & Lt., ctfs. full pd.	m114	108¾	111¾
Elec. Pwr. & Lt., ctfs., com.—no par	27½	16¾	29½
Elec. Refrig. cap.†	12½	9¼	37¼
Elec. Ry. Securities, com.—no par	6	....	....
Elec. St. Battery com. $5.25—no par	71¾	63¼	79½
Elmira Wtr., Lt. & R.R., 7% pf.	103	99	101½
Emerson Elec., pf.	m109	107¾	111
Empire Pwr., ptc.†	33	26	39
Engr. Pub. Serv., $7 pf.—no par	107	93¼	107
Engr. Pub. Serv., com.—no par	39½	21¾	39¾
Eureka Vacuum Cleaner, com. $4—no par	73¼	50	77
FAIRBANKS MORSE, 7% pf.	k109	107½	112
F.-M., com.—$3—no par	36½	32	43½
Federal Lt. & Trac., com. $1.40	40¾	37½	47
Federal Lt. & Trac., $6 pf.—no par	k 98½	91½	100
Ft. Worth Pwr. & Lt., 7% pf.	k112	108	112
GALVESTON-HOUSTON ELEC. 6% pf.	18½	68	72
Galveston-Houston Elec., com.	35	22	37½
Gen. Elec., $3 com.—no par	135½	81	146¾
Gen. Elec., special—6%	11¼	11	11¾
Gen. Gas & Elec. (Del.) com. A. $1.50—no par	39	34	47½
Gen. G.&E. (Del.) com. B—no par	m 45	35½	44½
Gen. G.&E. (Del.) pf. A. $8—no par	k117	113½	120
Gen. G.&E. (Del.) pf. A $7—no par	k110½	100	110½
Gen G.& E. (Del.) pf. B $7	k100½	96	105
Gen. Pub. Serv., $7 cum. pf., no par	k109	102	106
Gen. Pub. Serv., com., no par	17½	11¼	18
Ga. Lt., Pwr. & Rys., 6% pf.	93	87	96
Ga. Lt., Pwr., & Rys., com.	m 50	50	80
Ga. Ry. & Pwr., 8% pf.	k125	119	125
Ga. Ry. & Pwr., 7% pf.	k113½	106	110
Gt. Western Pwr., 7% pf.	k102½	....	....
IDAHO PWR., 7% pf.	106	103	109
Ill. No. Utilities, 6% pf.	a 96½	92	97
Ill. Pwr. & Lt., 7% pf.	101½	99	101½
Ingersoll Rand com. $8	k 90	88	96½
Int. Combus. Engr., com. $2—no par	49½	43½	64
Int. Util., Class A—$3.50—no par	k 41	24	45½
Int. Utilities, Class B—no par	6½	3	7¾
Interstate Pwr., pf.—$7—no par	96	93	98
Interstate Pub. Serv., 7% pf.	100	98	99½
Iowa Ry. & Lt., 7% pf.	97	97	99
JERSEY CENTRAL PWR. & LT. CO., 7% pf.	104	97½	105
Johns-Manville, com. †—no par	121½	55½	123½

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid price Saturday, Oct. 8. *l*Bid Price Tuesday, Oct. 11. *m*Latest quotations available. †Dividend rate variable.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Monday Oct. 10	Low 1927	High 1927
KANSAS CITY PWR. & LT. pf.$7	k115	112	115½
Kansas Gas & Elec., 7% pf.	l107	103	107
Kentucky Hydro-Elec., 7% pf.	k 97	93½	98
Kentucky Sec.,6% pf.	86	83	87
Kentucky Sec., 5% com.	109	110	115
Kentucky Utilities, 6% pf.	100	95	101
Keystone Pwr. & Lt., pf.	m 98	95	100
LACLEDE GAS LT., 12% com.	210½	173½	267½
Lehigh Pwr. Sec., com.—no par.	20½	15	21½
Long Island Ltg., 7% pf.	108½	107½	114
Long Island Ltg., com.†—no par.	171	140	174
Los Angeles Gas & Elec., 6% pf.	102	98	104½
Louisville Gas & Elec., cl. A. $1.75	26½	23½	27½
MAN. ELEC. SUPPLY, cap. $5 —no par	50½	47	132
Manila Elec., com.†—no par.	k 50	40	50½
Maytag Mfg., com. 50—no par.	33½	23½	34½
Memphis P. & L., pf.—$7—no par	109	107	109
Metropolitan Ed., pf.—$6—no par.	101½	93	100
Metropolitan Ed., pf.—$7—no par.	108	104	108
Metropolitan Ed., com. $5—no par.	75	60	72
Middle West Utilities, 7% pf.	a113½	110½	113½
Middle West Util., 8% pr. lien	a122	117½	122½
Middle West Util., com. $6—no par	a112½	108	117½
Midland Utilities, pr. in. 7% pf.	a104½	97½	107½
Midland Utilities, 7% pf. A	a102	96½	103½
Milwaukee Elec. Ry. & Lt., 7% pf.	k102	100	103
Milwaukee Elec. Ry. & Lt., 6% pf.	k 98½	98	101½
Minn. Pwr. & Lt., 7% pf.	l107½	104	107
Miss. Pwr. & Lt., $8 pf.	m101	106	103
Miss. River Pwr., 8% pf.	103	94	103
Miss. River Pwr. 3% com.	62	....	....
Mohawk Hudson Pwr., 1st pf.—$7 —no par	106	100	109
Mohawk Hudson Pwr., 2d pf.—$7 —no par	110	98	112
Mohawk Hudson Pwr., com.—no par	30½	20½	32½
Montana Pwr., 7% pf.	m106½	118½	106½
Montana Pwr., 5% com.	109	81½	109½
Montreal Pwr., 7% com.	f 91½	....	....
Mountain States Pwr., 7% pf.	100	97	101
Mountain States pwr., com.†	18	....	....
NASSAU & SUFFOLK LTG., 7% pf.	107	98	105
National Carbon, 8% pf.	a138	130½	139½
National Elec. Pwr., A†	a 26	22	26
National Lt., Ht. & Pwr., com.	24	....	....
National, Light, Ht. & Pwr., 5% pf.	70	....	....
National Pwr. & Lt., pf.—$7—no par	107	101	108½
National Pwr. & Lt., com.†—no par.	25	19½	26½
National Pub. Serv., 7% pf.	100½	93	100
National Pub. Serv., 7% ptc., pf.	113	108	115
National Pub. Serv., A com. $1.60— no par	23½	18½	24
National Pub. Serv., B com.—no par	20	14	20½
Nebraska Pwr., 7% pf.	l110	106	110
Nevada-Calif. Elec., com.	k 32	25	32
New Brunswick Pwr., 4% pf.	60	....	....
New Eng. Pub. Serv., pr. in. pf. $7..	101	98½	102
New Eng. Pub. Serv., pf. $7	98	95	99
New Orleans Pub. Serv.—7% pf.	103	103	105½
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	90	91	97
N. Y. Central Elec., 7% pf.	102	101	104
Newport News & Hampton Ry., Gas & Elec., 5% com.	109	....	....
Newport News & Hampton Ry., Gas & Elec., 7% pf.	109	....	....
Niagara Falls Pwr., 7% pf.—25	k 29½	27½	29½
Niagara, Lock. & Ont. Pwr., 7% pf.	114	112½	116
No. Amer., 6% pf.—50	53½	50	55
No. Amer., com.—10	64	45½	64½
No. Caro. Pub. Serv., pf.—$7—no par	101	93	102½
Northeastern Pwr., com.	20½	14½	20½
No. N. Y. Utilities, 7% pf.	106	103	109
No. Ohio Pwr., com.—no par.	17½	9½	18½
No. Ohio Trac. & Lt., 6% pf.	83	78	81
No. Ont. Lt. & Pwr., 6% pf.	k 91½	84	95
No. Ont. Lt. & Pwr., 4% com.	72	73	78
No. States Pwr., (Del.) 7% pf.	107	101	107½
No. States Pwr., (Del.) 8% com.	130½	109½	133
No. Texas Elec., 6% pf.	65	65	70
No. Texas Elec., com.	25½	27	36
OHIO BRASS, com. B $4—no par.	84	74	85½
Ohio Brass, 6% pf.	105	100	105
Ohio Pwr., 6% pf.	101½	96	103
Ohio Pub. Serv., $6 pf.	98½	95	96½
Ohio Pub. Serv., 7% pf.	107½	103	109
Ohio River Edison, 7% pf.	108	103	109½
Oklahoma Gas & Elec., 7% pf.	102½	...	....
PACIFIC GAS & ELEC., 6% pf.	26½	24½	26½
Pacific Gas & Elec., 8% new com.	42½	31	45½
Pacific Pwr. & Lt., 7% pf.	l105	102	104½
Penn Cent. Lt. & Pwr., $5 pf.—no par	c 77	75½	77½
Penn-Ohio Edison, 7% pf.	102½	97½	104½
Penn-Ohio Elec., 7% pf.	102	99	103
Penn-Ohio Pwr. & Lt., 7% pf.	102	99	103
Penn Pwr.& Lt.—$7—no par.	l109½	107	109
Penn Wtr. & Pwr., 8% com., new	c 71	47½	73½
Phila. Co., 6% pf.—50	c 52½	49½	54
Phila. Co., com.—50	k103	85½	110
Phila. Elec., 8% com.—25	c 55	46½	58½
Portland Elec. Pwr., 7% pf.	100	97½	101
Portland Elec. Pwr., 6% pf.	80	78	83
Portland Elec. Pwr., 6% 2d pf.	65	55	70
Portland Elec. Pwr., com.	27	22	30
Potomac Elec. Pwr., 6% pf.	l10½	....	....
Pwr. Corp. of N. Y., com. $1—no par	m 79	....	....
Pwr. Sec., pf.—no par.	k 38	28	43
Pwr. Sec., com.—no par.	k 11	5	8
Public Serv. of Colorado, 7% pf.	l102½	99	102
Pub. Serv. of N. J., 6% pf.	102½	98½	102½
Pub. Serv. of N. J., 8% pf.	132	125	132
P. S. of N. J., $2 com.—no par	44	32	46½
Pub. Serv. of No. Ill., 6% pf.	a106½	101½	106½
Pub. Serv. of No. Ill., 7% pf.	a117½	112½	117½
P. S. of No. Ill., com. $8—no par	a150½	140½	153
Pub. Serv. of No. Ill., $8 com.	a152½	132	153
Pub. Serv. of Okla., 7% pr. in.	k117	112½	117½
Pub. Serv. Elec. & Gas, 6% pf.	107½	102	108½
Puget Sound Pwr. & Lt., 7% pr. pf.	106½	105	107
Puget Sound Pwr. & Lt., $6 pf.—no par	88	....	....
Puget Sound Pwr. & Lt., com.	34½	28	38½
RADIO CORP. OF AMER., $3.50 pf.—50	53½	49	54½
Radio Corp. of Amer., com.—no par.	65½	41½	68½
Republic Ry. & Lt., pf.	m120	....	....
Republic Ry. & Lt., com.	m135	112	135
Rochester Gas & Elec. 6% pf. D	k104½	101	103½
Rochester Gas & Elec., 7% pf. B	104	105	107
Rochester Gas & Elec., 6% pf. C	k104½	101½	103½
SAFETY CABLE, com. $4.	69½	52½	74½
San Joaquin Lt. & Pwr., 7% pr. pf.	106	105	108
St. Joseph Ry., L., H. & P., 5% pf.	72	70	73
Servel Corp.	75cts	52cts	10½
Sierra Pacific Elec., 2% com.	31½	24½	31½
Sioux City Gas & Elec., 7% pf.	104	99	104
Southeastern Pwr. & Lt., pf.—$7 no par	l110½	....	....
Southeastern Pwr.& Lt.,ptc.pf.	l 82½	....	....
Southeastern Pwr. & Lt., com.—no par	39½	29½	40
So. Calif. Edison, 8% pf.	39	36½	40
So. Calif. Edison, 7% pf.	29	27	29
So. Calif. Edison, 6% pf.	25½	24½	27
So. Calif. Edison, 8% com.	39½	31½	41
Southern Cities Utilities, 7% pf.	80½	69½	92
Southern Cities Utilities, com. $4	a 32½	25½	33
Southwestern Lt. & Pwr., A $3.	63	60	65
Southwestern Lt. & Pwr., B.	63	60	65
Southwestern Lt. & Pwr., $6 pf.	86	83	91½
Southwestern Pwr. & Lt., 7% pf.	k109	103	110½
Springfield (Mo.) Ry. & Lt., 7% pf.	102	95	102
Standard Gas & Elec., 8% pf	64½	57½	65
Standard Gas & Elec., 7% pr. pf.	110	103	110
Standard G. & E., com. $3.50—no par	63½	54	65½
Standard Pwr. & Lt., 7% pf.	101½	98	102½
Staten Island Edison, pf.—$6—no par	100	99	101
Superheater, $6 com.—no par.	k172	166	181½
Syracuse Lighting, 7% pf.	110	103	107
Syracuse Lighting, 8% pf.	117½	....	
Syracuse Lighting, 8% com.—no par	m300	....	....
TAMPA ELEC., com. $2.	63	49	64½
Tenn. Elec. Pwr., 6% pf.	99	92	99
Tenn. Elec. Pwr., 7% pf.	107½	103	109
Terre Haute, Ind. & East. Trac., 5% pf.	26	20	30
Terre Haute, Ind. & East. Trac., com	1	1	3
Tex. Pwr. & Lt., 7% pf.	l112	106	111½
Tide Water Pwr., 8% pf.	109	105	110
Timken Roller Bear., com.—$4 no par	119½	78	142½
Toledo Edison, 8% pf.	114	115	118
Toledo Edison, 7% pf.	l107	102	107
Toledo Edison, 6% pf.	k 98½	95	97
Toledo Edison, 6% com.	98	....	....
Tri-City Ry. & Lt., 6% pf.	96½	96	99
UNITED GAS & ELEC., 6% pf.	101	98	102
United Gas & Elec., com.—no par.	m 57	....	....
United Gas & Elec. (N. J.) 5% pf.	72	70	73
United Gas Impr., 8% com.—50	c 115½	89½	118½
United Lt. & Pwr., pf.—$4—no par.	a 55½	50	57
United Lt. & Pwr., pf.—$6.50—no par.	a 95	87	97½
United L. & P., com. A .48—no par.	a 14½	12½	17
United L. & P., com. B .48—no par.	a 19½	15	2a
Utah Pwr. & Lt., 7% pf.	l107½	104	108½
Utica Gas & Elec., 7% pf.	105	105	106½
Utica Gas & Elec., 8% com.	200	....	....
Utilities Pwr. & Lt., 7% pf.	95½	93	100
Utilities Pwr. & Lt., com. A $2.	30½	27	34
Utilities Pwr. & Lt., com. B $1—no par	20½	13½	21½
VERMONT HYDRO-ELEC., 7% pf.	99	95	100
Virginia Elec. & Pwr., 7% pf.	108	105	110
Virginian Pwr., 7% pf.	k108	....	....
Virginian Pwr., com.	75	....	....
WAGNER ELEC., 7% pf.	b 87	68	90
Wagner Elec., com.—no par.	b 30	18½	30½
Washington Ry. & Elec., 5% com.	370	....	....
Washington Ry.& Elec.,5% pf.	98½	....	....
Washington Wtr. Pwr., 8% com.	174	136	182
West Penn Elec., 7% pf.	111½	102	112½
West Penn Elec., Cl. A $7.	107½	97½	110
West Penn Pwr., 7% pf.	115	111	118
West Penn Pwr., 6% pf.	107½	100½	108½
West Virginia Lt., Ht. & Pwr., 7% pf.	92	94	96
West Va. Utilities, 7% pf.—50	m 90	48	51½
Western Pwr., 7% pf.	k103	98	101½
Western States Gas & Elec., 7% pf.	k104	96	105
Western States Gas & Elec., com.	m 38	....	....
Westinghouse Elec. & Mfg., 8% com. —50	85	67½	89½
Weston Elec. Instrument, Cl. A $2 —no par ex.div.	k 30½	30	34½
Weston Elec. Instrument, com.—no par	13½	11	16½
Wheeling Elec., 6% pf.	102	95	104
Worthington Pump, 7% pf. A.	k 45	46	61½
Worthington Pump, 6% B.	42	40	54½
Worthington Pump, com.	k 33	20½	46
YALE & TOWNE com. $5—25.	k 81	70½	84½

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid price Saturday, Oct. 8. lBid price Tuesday Oct. 11. mLatest quotations available. †Dividend rate variable.

electric industry. Such a measure would have no effect in limiting accumulations of wealth, because the larger the corporation the greater number of shareholders of moderate means. The proper basis of taxation of public utilities is "benefits received by the company" rather than the company's "ability to pay."

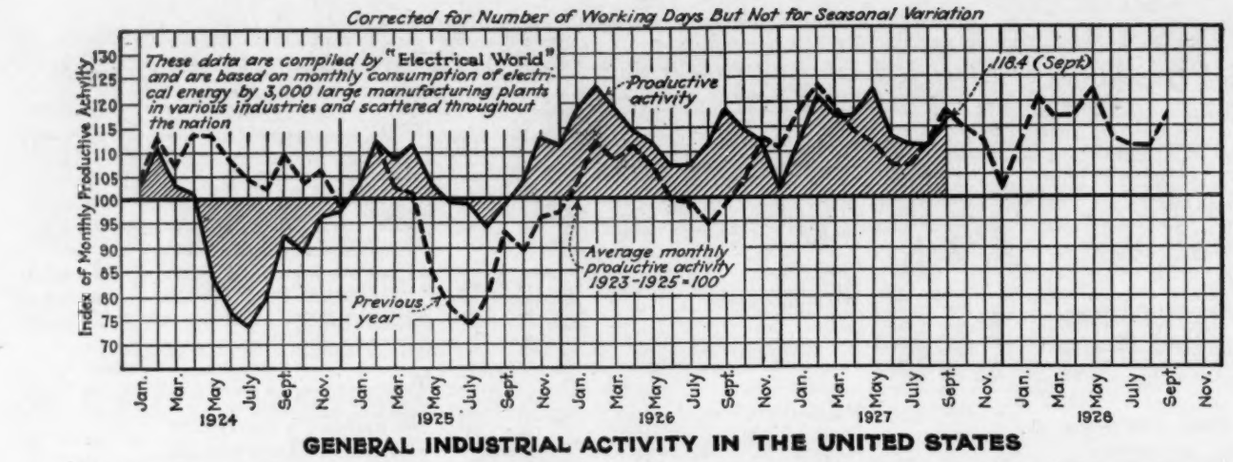
Another underlying basis is equality and uniformity among taxpayers. The tax burden of gas and electric companies is already greater than that imposed on manufacture, trade and banking. Uniformity and equality require reduction rather than increase. Increased taxes might kill the growing use of house heating by gas and the increased use of electricity for power, with their attendant results of a cleaner atmosphere and better health. It might stifle the increasing use of electrical energy on the farms, with the results of decreased muscular effort and a longer life for the farmers and the "electrocution of household drudgery" for the farmers' wives and daughters. It might result in decreased use of electrical energy for power everywhere, thwarting the vastly increased efficiency of labor, with consequent shortened hours of work. The president of the American Federation of Labor said only last month that the general use of electricity has substantially increased the real wages of labor and reduced the cost of manufactured articles. Is that a development to be choked by taxation?

HAMBURG UTILITY CALLS DEBENTURES.—Certain ten-year 7 per cent external gold debentures of the Hamburgische Electricitäts-Werke due Nov. 1, 1935, aggregating $100,000, have been called for payment Nov. 1 next at par and interest.

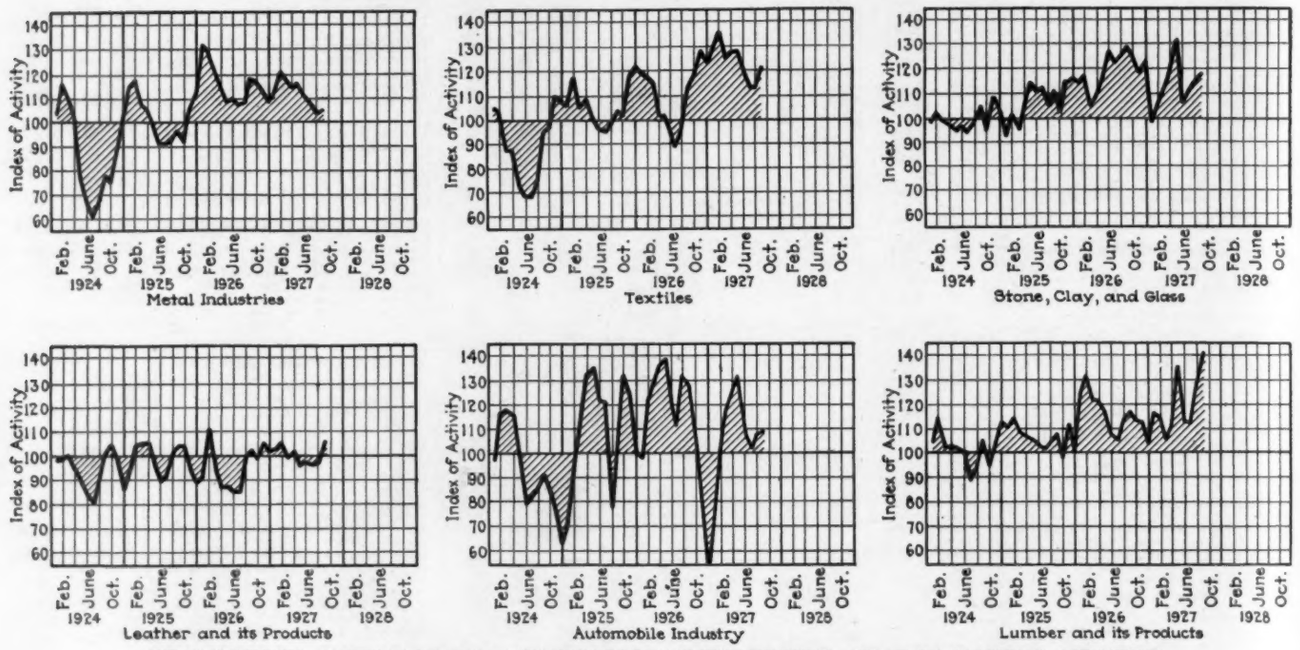
Oregon Makes New Ruling on Utility Issues

Public utility holding companies hereafter intending to operate in Oregon on a brokerage basis must first be fully prepared to convince the State Corporation Department that their holdings consist of established properties of sufficient value before applications for permits to sell securities will be granted. This is the substance of a new ruling made in connection with the practice of buying and selling small utility properties in Oregon.

According to the department, the state is not concerned with the activities of brokerage operators who merely purchase and sell utilities, but when these same operators make a tentative "buy" and then proceed to mortgage the holdings and float a bond issue the department becomes directly interested.


Corrected for Number of Working Days But Not for Seasonal Variation
These data are compiled by "Electrical World" and are based on monthly consumption of electrical energy by 3,000 large manufacturing plants in various industries and scattered throughout the nation
Productive activity
118.4 (Sept)
Average monthly productive activity 1923-1925=100
Previous year
Index of Monthly Productive Activity
Jan. Mar. May July Sept. Nov.
1924 1925 1926 1927 1928

GENERAL INDUSTRIAL ACTIVITY IN THE UNITED STATES



PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE UNITED STATES

Industrial Activity Maintains Level

Is on Par with 1926—Normal Seasonal Increase During September —Steel, Metal-Working and Automobile Industries Operating Materially Under Last Year

THAT the rate of general productive activity of the manufacturing plants of the nation during the current fall months is approximately the same as that witnessed during the same period last year is indicated by reports received by the ELECTRICAL WORLD from approximately three thousand large manufacturing plants scattered throughout the nation and in various industries—plants consuming more than 15,000,000,000 kw.-hr. of electrical energy per annum. The basic figures for September indicate that the productive activities of general industry during that month were 0.2 per cent under September of last year and 20.7 per cent over September of 1925. The activities during September, however, were 7.1 per cent over August, which is approximately the same seasonal increase in activity as reported during September last year. The September rate of activity was about 3.2 per cent under that of May, the month of peak activity during the current year, but was 1.4 per cent over the average monthly activity during the first half of the year. The immediate outlook in manufacturing is for a slightly more than seasonal expansion.

A fundamental factor in the economics of American industry is clearly portrayed in the index figures of general productive activity during September in that while some of the nation's most basic industries are at present operating materially under last year, other just as basic and important industrial groups are reporting activities over those of last year. This industrial condition constitutes one of the outstanding factors underlying our present continuous period of prosperity. During September five of the national primary industrial groups—iron and steel, metal working, automobiles, paper and pulp, and stone, clay and glass—were operating at a rate materially under the activity reported for September last year. On the other hand, six of the important industrial groups—textiles, leather and its products, food, lumber and its products, rubber and its products, and chemical and allied products—reported activities materially above those of 1926.

It is this equalizing or stabilizing of general American industry which is doing much to prolong the present period of prosperity in the nation as a whole. The purchasing power of the general public remains large, if it is not slowly increasing. It would seem that the public demand is slowly changing and that those commodities and supplies of certain industrial groups which have since the war reflected the greatest public demand are giving way to other commodities in other industrial groups. The high public purchasing power is still present and must find an outlet through one demand or another.

Business News and Market Conditions

India a Growing Market for Our Electrical Goods

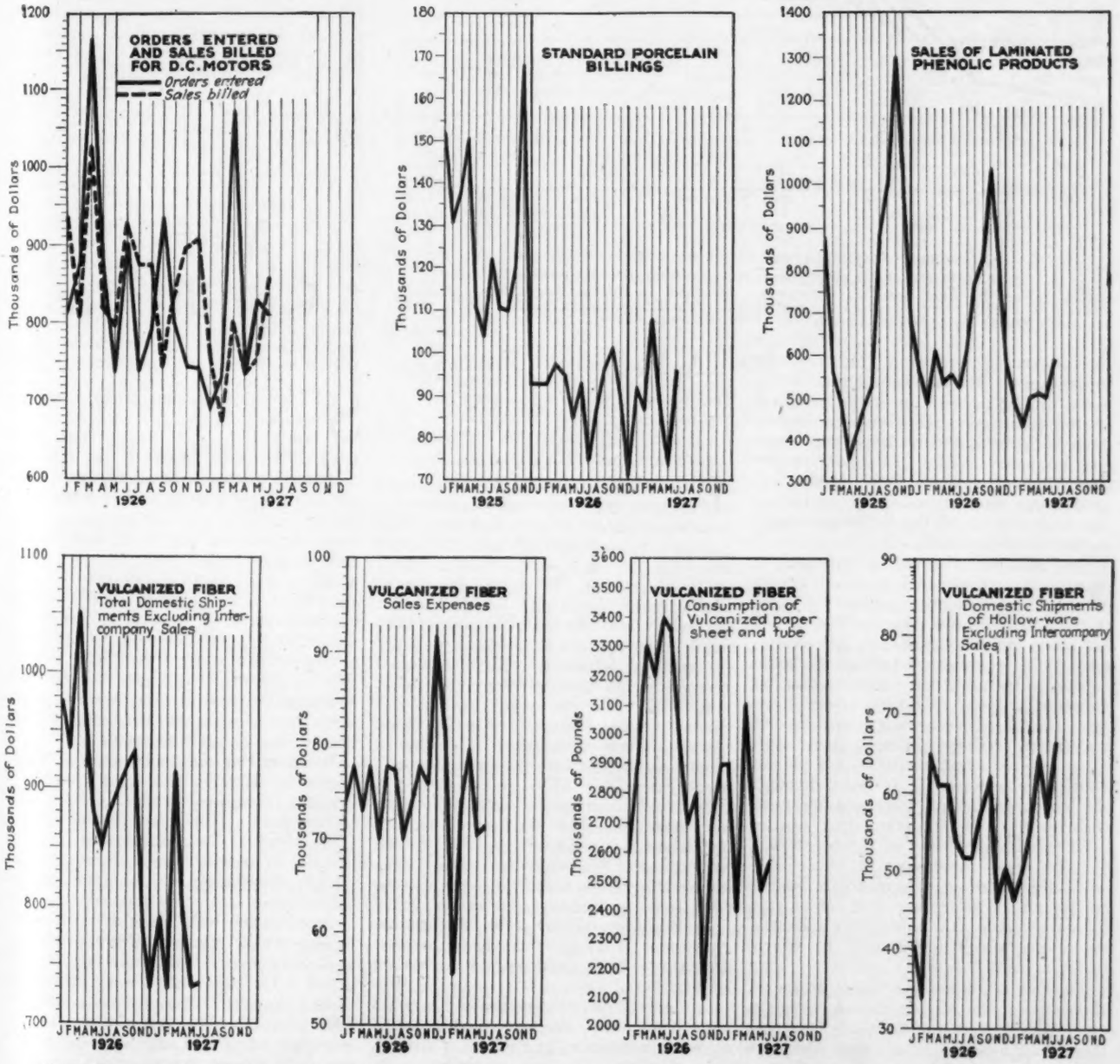
For the past two years British India has been a large market for United States electrical apparatus, a report issued by the Commerce Department's Electrical Equipment Division discloses. In 1926 American total shipments to India of this class of goods were valued at $2,144,000 as compared with $1,650,000 in 1925 and $1,011,000 in 1924. Imports of electrical equipment into the Indian market are predominantly British, it is pointed out, a natural result of the preference of British engineers for types and designs with which they are familiar. The growing tendency, however, toward the adoption of American engineering methods will probably increase our proportion in the future.

The purchasing power of the bulk of India's millions is too low to permit purchase of domestic electric appliances, but the wealthy Indians and the European residents form a group to which serious attention should be given by American exporters. The feeling in India, the report states, is decidedly optimistic in connection with the expansion of that country's market for electric household devices in the near future. The superiority of American domestic equipment is generally recognized, but price rather than quality rules in India, and American manufacturers find it difficult to meet the prices of their competitors.

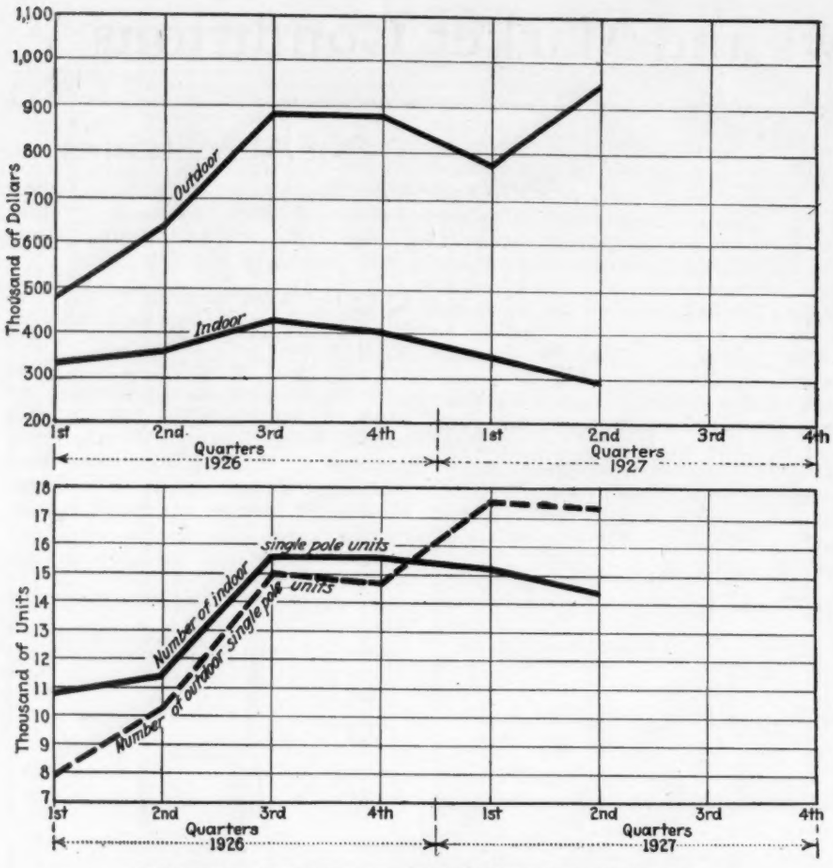
N.E.M.A. Statistics

Work Progressing, but Greater Degree of Co-operation Is Needed to Make More Data Available to Manufacturing Branch of Industry

STATISTICS gathered by the National Electrical Manufacturers' Association have been brought up to date and are again presented in this issue. The first complete list was published on pages 193 and 194 of the July 23, 1927, issue of the ELECTRICAL WORLD. Data gathered by the N.E.M.A. have been increasing, though slowly. This is not because the industry has failed to realize the importance of this work, but rather because such undertakings are



STATISTICS COVERING DIRECT-CURRENT MOTORS, STANDARD PORCELAIN, LAMINATED PHENOLIC PRODUCTS AND VULCANIZED FIBER



QUARTERLY STATISTICS OF POWER-SWITCHING EQUIPMENT
(Exclusive of oil circuit breakers, switchboards and fuses)

Note.—For the first time statistics were gathered on bus supports for the second quarter of 1927. The orders placed during that quarter amounted to $217,445, and the number of units covered was 43,542.

slow in coming to fruition. No manufacturer can make a marketing plan without a proper conception of the program of the industry. Facts and conditions must be known, and on these a premise can be based. The N.E.M.A. is endeavoring to furnish these facts, but, of course, can succeed only so far as the co-operation of the different manufacturers is extended.

Business requires for its guidance a store of accurate and pertinent facts. With a lack of information the electrical manufacturer is compelled to lay his plans by guesswork and approximation. The gigantic waste from the boom of 1920 through the depreciation in value of excessive stocks might have been prevented, or at least considerably minimized, if there had been more complete information available as to the volume of stocks. It is only through the co-operation of the industry, and through a wider understanding of the problems involved and of the co-ordination of effort necessary to obtain results, that further progress can be recorded and a more complete set of statistics be made available to the industry as an anchor of basic facts to which to tie.

The few statistics now being gathered should point the way to a more complete understanding of the industry's status, through the collection of more complete data on stocks and sales.

A Favorable Forecast

Ten Major Elements Assuring the Continuation of Successful Business Are Cited by the "American Bankers' Association Journal"

TEN major elements in business are cited by the *American Bankers' Association Journal* to give assurance that the final record of 1927 will be favorable. On this basis the periodical makes the forecast that 1928 will see a satisfactory carry-over with which to start the new year. The ten factors cited are:

1. Total agricultural income should exceed the estimated $12,000,000,000 average of the last five years.

2. While a credit expansion has occurred, going principally into the stock market, nevertheless there is plenty of credit available for commercial purposes.

3. Numerous major industries that have been somewhat slack this year are not headed for depression, but rather for improved conditions in 1928. These industries include steel, oil, automobiles, coal, textiles, tanning and shoes.

4. Building construction, the aggregate new building and repair expenditure are being maintained at record levels.

5. General commodity prices have become firmer and encourage expectation of a recovery after more than a year of slow decline. Unusual gains have occurred in farm products, which have at last reached the parity with other goods that has been the farmer's goal for several years.

6. During the year the stock market barometer could be read only one way—clear weather ahead. Prices of stocks are high, judging certain individual issues or the averages, although not all groups have had an advance. Some shares may seem overvalued at present, others are doubtless cheap. Many companies have such sound values as to be recommended for investment holding at any price. There may be a market break at any time; nevertheless, the market itself stands optimistic as to the future.

7. The bond market is in healthy condition, with prices the highest in years.

8. Foreign trade has held up remarkably well.

9. Government finances are in better shape than for more than a decade.

10. Probable legislation to be taken up by Congress causes some concern in the financial world, but no actions that would materially affect the course of business are expected. Tax reduction will be bullish to business. There is so far no evidence that the election bogy must necessarily hamper business next year.

Market Conditions

SALES in the electrical industry compare favorably with those of last year for the same period. The General Electric Company, as reported elsewhere in this issue, announces a decrease of 5 per cent in sales for the third quarter of this year as compared with the same quarter last year, and for the nine months ended Sept. 30 sales show a decrease of about 6 per cent. From reports of other members of the electrical manufacturing industry it is probable that total sales of the industry are more nearly equal to those of last year. Manufacturers continue to refer more to the aggressive competition with correspondingly low prices and decreased profits than to the volume of business.

In New England sales show a slight decrease, although the total volume of business compares favorably with that of last year. Small-motor sales remain fairly steady. Good business is reported in sales of indoor equipment to central-station companies. A fair demand for transmission and distribution apparatus is noted in the New York district. Conditions are satisfactory in the Southeast, and construction materials are in demand. Outstanding large industrial orders placed in that territory cover two 600-kw. turbo-generator units. A considerable volume of substation apparatus and high-tension transformers was also

purchased. A perceptible improvement was noted in the demand for motors and transformers in the St. Louis district. A cement company in that territory bought $75,000 worth of such apparatus. The improvement of general business in the Middle West is small but steady. On the Pacific Coast power companies have been large buyers. Inquiries have included large quantities of insulators and poles.

Little Change Noted in Non-Ferrous Metal Market

Developments in the non-ferrous metal markets have been unimportant. Zinc prices are a little higher and tin is a little easier, while lead and copper are virtually unchanged. Copper buying has been the smallest in two months. The large volume that producers have been expecting has not yet developed. Only two sellers did business under 13¼ cents delivered in Connecticut, but the tonnage at lower figures exceeded that at the even quarter by a good margin. On Thursday several good sales were made at 13⅜ cents, but since then the lowest prices have been 13.15 cents and 13.175 cents. At the same time sales have been made each day during the week at 13.25 cents particularly on the last few days.

The buying of zinc that materialized in such large volume when the price sagged to 6 cents last week subsided as prices were advanced. Nevertheless a fair business was done and prices seem firm at the higher figure. Most sellers sold satisfactory tonnages of lead, which was in considerably better demand than copper. Prices were unchanged, practically all sales being made on the basis of 6¼ cents, New York, which figure also continues as the contract price of the American Smelting & Refining Company.

NEW YORK METAL MARKET PRICES

	Oct. 5, 1927 Cents per Pound	Oct. 12, 1927 Cents per Pound
Copper, electrolytic	13.20	13.20
Lead, Am. S. & R. price	6¼	6¼
Antimony	11	11
Nickel, ingot	35	35
Zinc spots	6.35	6.45
Tin, Straits	58.75	58
Aluminum, 99 per cent.	26	26

Base copper price Oct. 12, 1927, 15¼ cents.

The tin market was largely a routine affair until Tuesday, when lower prices in London brought offerings here as low as 57¾ cents for prompt Straits tin. Consumers then entered the market and quickly pushed the price up to 58 cents, at which level an appreciable tonnage was sold.

New England Sales Show a Slight Decrease

Reports received in the New England district indicate that the buying of electrical supplies and equipment has showed a decrease. No outstanding orders were noted, though the total volume of business, in view of the seasonal tendency, compares favorably with that of last year. Small-motor sales remain fairly steady, and central-station supplies for outdoor needs are now well taken care of. The demand for indoor equipment is resulting in good business with small switches, control apparatus and insulators selling well. Orders for electric heating furnaces are being considered, according to one manufacturer, but actual buying is lagging somewhat. Street-lighting projects are about closed for this season, and electric traffic signal stations are selling well. A refrigerator manufacturer reports increasing sales, with September returns very encouraging. Electric range sales are gaining, and appliance sales reported by one central-station group exceeded the previous week's volume by over $4,300. New lighting contracts let include one for $25,000 for Cambridge, Mass. The Multibestos Company, Walpole, Mass., is building a large addition to its plant.

Fair Demand for Transmission Apparatus in New York

The condition of the market for electric apparatus in the New York district shows little change. Sales of switching equipment, poles, cross-arms and hardware continue quiet and the volume of inquiries is not large. There is a fair market demand for transmission and substation apparatus. Several new substations and enlargements are projected locally, and some inquiries are reported from holding companies for apparatus to be installed outside of New York. Buying of motors by industrial users fell off and the demand for control apparatus is quiet.

Increasing Business Noted in Southeast

Satisfactory conditions throughout the Southeastern territory are beginning to be reflected in general activities, and a number of inquiries for construction materials show somewhat of an increase over the preceding weeks. Outstanding large industrial orders for the past ten days cover two 600-kw. turbo-generators for a Louisiana firm aggregating approximately $50,000. Orders for switchboard and controller equipment for these turbines are also in hand. While no very large central-station orders are reported, there is a considerable volume of substation equipment and high-tension transformer equipment orders being placed, the aggregate volume amounting to approximately $40,000. Transmission-line construction, mostly of 44,000-volt type, continues active, and contracts were let on one line 40 miles long which will call for material orders during the next ten days. Meter and small distribution transformer orders are reported reasonably satisfactory, while the central-station lamp business is excellent. Rumors indicate that large central-station interests will soon call for bids for two large steam generating stations in the Southern territory.

Orders for industrial electrical equipment are reasonably active. Two orders, one for $5,000 and one for $10,000, were received from the Mississippi section, while mining interests were represented in the Birmingham section by electric mine locomotive orders aggregating $10,000. Inquiries from industrial plants dominated by the textile field, and considerable preliminary estimating is under way, with consequent inquiries on motors and wiring materials.

Sales of Motors and Transformers Improve in St. Louis

There has been a perceptible improvement in the demand for smaller-sized motors and transformers in the St. Louis district, and a few contracts have been booked. One order covered five 15-kw. direct-current generators with switchboards, panelboards and fittings for pipeline pumping stations at a cost of $6,500. An order for transformers and switches from a local power company amounted to $80,000. Four 250-hp. motors for driving drainage pumps priced at $20,000 were purchased as well as three smaller drainage pumps with motors costing $15,000. An order from one of the cement companies for motors, transformers and switches totaling about $75,000 was also placed.

Small but Steady Improvement Noted in Middle West

General business in the Middle West continues to improve. The volume is increasing, although the increase is so gradual as to be negligible. However, it is generally admitted that business conditions are improving. Encouraging reports from agricultural districts, together with the steel industry, further confirm this opinion. The various utility companies are busy with construction work and maintenance purchasing is quite heavy. Among the interesting items ordered were coal-handling equipment complete with appurtenances valued at $375,000, construction of foundation, basement story, plumbing, etc., for a distribution center valued at $150,000, and seventeen outdoor potential transformers, 60-cycle, 500-volt-amp. capacity, 550 to 1 ratio.

Jobbers' sales are increasing. The holiday purchasing has started in earnest and distributors are buying large quantities of electrical appliances. There has been a good demand for vacuum cleaners, one jobber placing an order for 1,000 machines.

Power Companies Large Buyers on Pacific Coast

Power companies have loomed large in the week's purchasing on the Pacific Coast. Their inquiries have included large quantities of insulators and assorted poles, including 150 35-ft., 100 55-ft., and one carload each of 45-ft. and 50-ft. poles and 12-ft. stubs, all butt-treated for delivery at Ramona, Cal. Other power company orders included three substation feeder voltage regulators valued at $4,000 and two carloads

of 60,000-volt pin-type units valued at $19,000. The city of San Francisco has bought nine assorted motors, sizes 150 hp. and 100 hp., valued at $9,000, for compressor motor drive in the Hetch Hetchy system; 330 overhead lighting units valued at $12,500 for the Geary Street installation and 50 sets of gears and helical pinions, costing $3,000, for the municipal street-car system. Unusual orders for industrial plants cover a large baking and enameling oven and 100 neon sign transformers. Other industrial orders cover a 75-kw. motor-generator set, amounting to $2,500, for Stockton, a 100-hp. motor, amounting to $3,500, for an oil company, nine assorted motors from 10 hp. to 100 hp., valued at $4,000, for a cement plant, and $3,500 worth of supplies, chiefly 3-in. conduit and rubber-covered cables for a Stockton paper warehouse. Prices are fairly steady, with market advances in rubber-covered wire and decreases in standard sockets because of bulk packing.

Slight decrease in the sales of motors and apparatus was noted in the Puget Sound district, although several orders of moment were placed. These included about $16,000 worth of transformers bought by a central-station company, a 250-kw. generator set for a sawmill in the Puget Sound district, about 25 motors from 100 hp. down for a pulp and paper mill extension, 21 2-hp. and 3-hp. motors for eastern Washington apple orchards, and six motors from 25 hp. down for a water district. The city of Tacoma will award contracts within a few days for three induction voltage regulators and a few circuit breakers, and the Bureau of Yards and Docks, Washington, D. C., wants bids until Oct. 26 for furnishing 800-kw. motor-generator sets, 100-kva. power transformers, switchboards and wire and control apparatus for the Puget Sound Navy Yard at Bremerton, Wash. Proposed street-lighting installations in Seattle, Vancouver, Washington and Portland, Ore., are attracting bidders. Seattle's downtown lighting program, involving $1,000,000, has been laid over two weeks by the City Council. Portland's lighting program, for which a contract has been let, calls for $45,000 to be expended for installation, while Vancouver plans letting a contract about the middle of November.

Activities of the Trade

General Electric Sales Show Slight Decrease

Orders received by the General Electric Company for the three months ended Sept. 30, 1927, amounted to $77,420,263, compared with $81,587,917 for the third quarter of 1926, a decrease of 5 per cent, according to an announcement by President Gerard Swope. For the nine months ended Sept. 30 orders totaled $233,076,091, representing a decrease of 6 per cent compared with $246,993,637 in the corresponding nine months of 1926.

Servel Reorganization Committee Appointed

George W. Davison, chairman; Nicholas F. Brady, Murray H. Coggeshall, Charles M. Kittle and Albert H. Wiggin make up the reorganization committee of the Servel Corporation (of Delaware), the Servel Corporation (of Indiana), the Servel Corporation of New York, the Servel Manufacturing Company and the Absorption Refrigerator Company, Inc. Receivers having been appointed, the committee will function under a plan and agreement for the reorganization, dated Sept. 27, 1927, copies of which may be obtained from the depositaries and sub-depositary under the plan or from the secretary of the committee. C. E. Sigler, 80 Broadway, New York City, is secretary of the committee. The depositaries are the Central Union Trust Company of New York, 80 Broadway, New York City, and the Chase National Bank of the City of New York, 57 Broadway, New York City. The sub-depositary is the Old National Bank in Evansville, Evansville, Ind.

American Metallurgical's Sales Increasing

Following a period of slight recession in the demand for electric furnace equipment, the American Metallurgical Corporation, Boston, reports a marked increase in sales, with excellent prospects for doubling the volume of production for 1926 by the end of the current year. President K. A. Juthe announced that among recent orders are the following: Two 60-kw. box-type carburizing furnaces and one 30-kw. cyanide pot furnace for the National Cash Register Company, Dayton; a 30-kw. wire-enameling oven for the Shepard Manufacturing Company, Worcester, Mass.; a 90-kw. annealing furnace for the Cleveland Twist Drill Company; a 20-kw. and 7.5-kw. pot furnace and a 60-kw. carburizing furnace for the Union Hardware Company, Torrington, Conn.; a 15-kw. cyanide pot furnace for the Underwood Typewriter Company, Hartford, Conn.; three 15-kw. tool hardening furnaces for the Ingersoll-Rand Company, Phillipsburg, N. J.; a 30-kw. carburizing furnace for the Fairchild-Caminez Engineering Corporation, Farmingdale, L. I.; a 30-kw. cyanide pot furnace for the Mattatuck Manufacturing Company, Waterbury, Conn.; a 20-kw. hardening furnace for the Imperial Knife Company, Providence, R. I., and a 7.5-kw. pot furnace for the Woonsocket (R. I.) Comb & Machine Company.

Westinghouse Gets Orders for Industrial Turbine Units

The Youngstown Sheet & Tube Company of Youngstown, Ohio, has placed an order with the Westinghouse Electric & Manufacturing Company for an 18,000-kw. three-phase, 6,900-volt generator unit. The new unit will be built at the South Philadelphia works and installed in the Campbell works at Youngstown. The turbine will be of the "CW" type, operating at 1,800 r.p.m. Steam will be supplied to the throttle at 385 lb. gage pressure, 258 deg. F. superheat, and exhaust at a pressure of 6 in. of mercury absolute.

The Anglo-Canadian Pulp & Paper Mills of Quebec, Canada, has also placed an order through the Canadian Westinghouse Company, Hamilton, Canada, for a 7,500-kw. three-phase, 2,400 volt turbo-generator unit. The turbine will be of the non-condensing automatic bleeder type and will operate at 3,750 r.p.m. Steam will be supplied to the throttle at 375 lb. gage pressure, 100 deg. F. superheat, and exhaust against a pressure of 25 lb. gage. The turbine will be so designed as to allow automatic bleeding of over 50,000 lb. of steam at a pressure of 110 lb. gage.

General Electric Refrigerator Distributors Hold Meeting

About 250 distributors of the General Electric refrigerator from all parts of the United States and from Hawaii gathered at Association Island, Henderson Harbor, N. Y., for the first time from Sept. 5 to 8 as "Camp Refrigeration." The purpose of the assembly was to discuss problems, exchange ideas of mutual interest, and to meet and mingle in good fellowship. At the opening session, P. B. Zimmerman, sales manager, addressed the meeting, followed by the Honorable Charles A. Eaton, congressman from New Jersey, who spoke on the scientific researches of the General Electric Company as affecting the public.

Arrow-Hart & Hegeman Combine Formally Approved

Formal approval of the plans for a holding company to bring together the combined resources of the Hart & Hegeman Company and the Arrow Electric Company, of Hartford, Conn., has been announced. Both companies manufacture a similar line of wiring devices. In the Aug. 6 issue of the ELECTRICAL WORLD it was reported that the directors of the Arrow company had approved the general consolidation plan. The holding

company will be a $2,000,000 corporation.

The new organization will be known as Arrow-Hart & Hegeman, Inc. Edward R. Grier, vice-president and general manager of the Arrow plant, will be the president of the holding company. No change was made in the personnel of the directing heads of either company, and they will operate as separate identities. The new organization was formed to effect economies in manufacture.

THE GRAYBAR ELECTRIC COMPANY about Jan. 15 will occupy a new one-story brick warehouse and office building on South Second Street between Linden and Beale Avenues, Memphis, Tenn. The company for many years has occupied the ground floor of the O.K. Storage Building at 161 Jefferson Avenue.

THE WESTINGHOUSE ELECTRIC INTERNATIONAL COMPANY announces the establishment of a new branch to be known as the Compañia Electrica Westinghouse de Chile, with activities in Chile and Bolivia. E. L. McCloskey, formerly manager of the Westinghouse Electric International Company in China has been appointed manager of the new branch, with headquarters at Santiago, Chile.

THE SPLITDORF ELECTRIC COMPANY, Newark, N. J., a subsidiary of the Splitdorf-Bethlehem Company, has purchased a controlling interest the American Electric Motors Company of Cedarburg, Wis. Plans are said to include expansion of the Cedarburg plant.

THE BAILEY METER COMPANY, Cleveland, has recently moved into its new quarters at 1060 Ivanhoe Road, where approximately three times as much floor space is available as existed in the old plant on East 46th Street. The company says that rapid growth and development in the field for metering and combustion-control equipment have again necessitated moving into larger quarters.

THE RELIANCE ELECTRIC & ENGINEERING COMPANY, 1042 Ivanhoe Road, Cleveland, announces that R. A. McDowell, formerly at Pittsburgh, has been made district manager at Cincinnati and that C. D. Herbert, formerly at Syracuse, has been made district manager at New York City.

THE GENERAL ELECTRIC COMPANY has let a contract for the erection of a large addition to the Winter Street foundry plant of its Fort Wayne works. The foundry will have a floor space of 10,500 sq.ft., and it is understood will be used for the manufacture of the company's refrigerating machines.

THE GRAYBAR ELECTRIC COMPANY, Graybar Building, Lexington Avenue and Forty-third Street, New York City, announces the appointment of H. B. Bibb as sales manager of its Norfolk branch house. The promotion of E. W. Thurston to assistant telephone sales manager was also announced. Mr. Thurston will now be stationed at the executive offices of the company, in New York.

THE HARBISON-WALKER REFRACTORIES COMPANY, Pittsburgh, through an exchange of stock, has acquired the Walsh Fire Clay Products Company of St. Louis.

THE ROBBINS & MYERS COMPANY, Springfield, Ohio, has taken over the patents of the Meyer Electric Manufacturing Company of Houston, Texas, manufacturer of clock operated time switches, and will add this item to its line of motors and fans. The switch will be put on the market in a short time under the name of the "Lamp-Lighter."

THE TRUMBULL STEEL COMPANY, Warren, Ohio, announces the appointment of E. K. Kennedy as assistant general manager of sales.

THE TRUSCON STEEL COMPANY, Youngstown, Ohio, will devote its new plant at Los Angeles entirely to the manufacture of building materials and not to steel poles and pole line hardware as stated in the Sept. 10 issue of the ELECTRICAL WORLD.

New Equipment Available

Earth-Boring Machine

A new Highway earth-boring machine has been placed on the market by the Highway Trailer Company, Edgerton, Wis. The boring unit of this machine is very similar to the larger machine that the Highway Trailer Company has always built for the American Telephone & Telegraph Company. It is powered by a Fordson motor and the entire unit is mounted on a crawler type track which can be maneuvered readily. Included in its mounting is a 2,500-lb. capstan and a one-piece boom or pole derrick rising from 14 ft. to 18 ft. above the ground in working position or which may be dropped to 8 ft. from the ground for road travel.

EARTH-BORING MACHINE IN OPERATION

The machine is capable of digging a hole 7 ft. deep, 20 in. in diameter and at an angle of 45 deg., at right angles to or with the machine. The manufacturer states that the machine is able to easily negotiate nearly every land condition since it transmits less than 4 lb. road pressure to the square inch. The manufacturer claims that for average terrain and soil conditions the machine will dig holes for and set from 50 to 60 poles per day. In a test made 10 holes were drilled and 10 poles were set in the ground in 55 min. The company also states that in actual line construction work a utility company was able to dig the holes and set 12 poles in one hour.

Belt Conveyor

A new type of belt conveyor offered in a complete line including carriers for belts ranging in width from 12 to 60 in. has been placed on the market by the Stephens-Adamson Manufacturing Company, 38 S. Dearborn Street, Chicago. The new carrier is known as the Stephens-Adamson "Simplex" carrier. The carrier proper consists of three rollers in line, the troughing rollers being mounted at a 20-deg. angle in order to increase the capacity of the belt. The carriers are mounted on a heavy steel angle section base, which is self-cleaning. The whole assembly is tilted slightly in the direction of belt travel, in order to facilitate the proper training of the belt. All the parts of the carriers, such as bearings, shafts, rollers, brackets, and complete roller assemblies are mutually interchangable for belts of the same size.

SELF-RESETTING UNDER-VOLTAGE DEVICE.—A new self-resetting, alternating-current, undervoltage device with adjustable time delay has been placed on the market by the General Electric Company for use with its motor-type operating mechanisms for oil circuit breakers. This device bears the designation MG-1. The company states that it may be readily applied to any existing installation of motor mechanisms of the type for which it is designed.

Electrical Patents

Announced by U. S. Patent Office

(Issued Sept. 13, 1927)

1,642,514, 1,642,515. CABLE JOINT; D. M. Simons. Apps. filed Aug. 5, 1925, and Jan. 13, 1926.

1,642,516. ELECTRICAL MEASURING INSTRUMENT; R. Simpson, River Forest, Ill. App. filed Oct. 21, 1926. Voltmeter and ammeter of the moving-vane type.

1,642,525. RECORDING DEVICE; E. B. Wheeler, New York, N. Y. App. filed Dec. 29, 1922. For recording temperature conditions and humidity.

1,642,550. SEALING RING; W. A. MacKenzie, Long Beach, Cal. App. filed May 19, 1926. For storage batteries.

1,642,567. SAFETY FUSE; G. Y. Tange, Cleveland, Ohio. App. filed June 18, 1924.

1,642,626. TWIN SOCKET; H. T. Paiste, Philadelphia, Pa. App. filed May 26, 1922.

1,642,649. TEMPERATURE - CONTROLLED ALARM; W. E. Fox, Omak, Wash. App. filed May 3, 1926.

(Issued Sept. 20, 1927)

1,642,695. BINDING POST; W. H. Pumphrey, New York, N. Y. App. filed Feb. 9, 1926.

1,642,698. POWER CABINET; G. F. Rohn, Milwaukee, Wis. App. filed May 14, 1921. With interchangeable panels for power-consuming devices of different capacities.

1,642,718. ATMOSPHERICALLY CONTROLLED SWITCH; J. E. Bolling, Chicago, Ill. App. filed Jan. 11, 1926.

1,642,742. THERMOSTAT SWITCH; O. G. Myers, San Mateo, Cal. App. filed Oct. 1, 1924.

1,642,743. FLUSH SWITCH; W. J. Newton, Bridgeport, Conn. App. filed April 28, 1924. May be employed for a one-way, two-way, three-way or four-way switch.

1,642,765. TROLLEY WHEEL; F. M. Clark, Bridgeport, Conn. App. filed Dec. 20, 1922.

1,642,870. ELECTRIC SWITCH; P. C. Butte, San Francisco, Cal. App. filed March 31, 1925. Safety switch for switchboard mounting in which fuses are combined with the switch, means being provided for preventing access to the fuses while the switch is closed.

1,642,883. SWITCHBOARD; A. C. Lyen and C. W. Morgan, Chicago, Ill. App. filed Sept. 27, 1922. Used in connection with testing benches for determining the functioning of automotive electrical devices such as small generators, starting motors, ammeters, switches, relays, etc.

1,642,932. MERCURY-TUBE SWITCH; I. E. McCabe, Chicago, Ill. App. filed July 9, 1923.

1,642,953. AUTOMATIC EXCESS HEAT PROTECTOR, ESPECIALLY FOR ELECTRIC MACHINES AND APPARATUS; W. Hickel, Zurich, and O. Pletscher, Jr., Albisrieden, near Zurich, Switzerland. App. filed Dec. 4, 1924.

1,642,988. SAFETY DEVICE FOR TRAVELING STRUCTURES; R. E. Brown, Pittsburgh, Pa. App. filed Feb. 19, 1927. Such as ore bridges, traveling docks or traveling cranes.

1,643,014. COOLING SYSTEM FOR ELECTRICAL APPARATUS; J. B. Hodtum, Bellevue, Pa. App. filed Dec. 7, 1925. A cooling system for apparatus such as transformers submerged in oil in a containing tank.

1,643,111. SHORT-CIRCUITING DEVICE FOR ELECTRIC MOTORS; F. J. Bullivant, St. Louis, Mo. App. filed Feb. 18, 1924.

1,643,126. LUMINOUS ELECTRODE DISCHARGE LAMP; C. F. Lorenz, East Orange, N. J. App. filed March 14, 1923.

1,643,127. CONTROLLER FOR ELECTRIC MOTORS; N. L. Mortensen, Milwaukee, Wis. App. filed April 25, 1921. Dynamic braking controller for motors employed in driving bucket hoists and the like.

1,643,146. MERCURY- RECTIFIER; J. Alexander, Zehlendorf, Berlin. App. filed Sept. 18, 1925.

1,643,178. WINDING FOR ALTERNATING-CURRENT APPARATUS; M. A. Savage, Scotia, N. Y. App. filed Dec. 29, 1925. Wherein the eddy current losses are reduced to a relatively low value.

1,643,209. SUSPENSION OF TROLLEY WIRES; M. J. Griffith, Schenectady, N. Y. App. filed Feb. 16, 1924.

1,643,210. ELECTRIC SWITCH; M. Guett, Hartford, Conn. App. filed June 10, 1924. For regulating the amount of current passing to an electric heater or some other device requiring different amounts of current.

1,643,213. ELECTRIC POWER SYSTEM; J. J. Kane, Milwaukee, Wis. App. filed Oct. 14, 1920. Apparatus for regulating generators driven by prime movers, such as engines or turbines connected to supply variable electrical loads, especially where there is a tendency for the generator-driving means to operate at a speed dependent upon the load.

1,643,216. MERCURY VAPOR AND RECTIFIER; C. Krämer, Berlin, Germany. App. filed Aug. 29, 1921.

1,643,227. METHOD OF METALLIC ARC WELDING; R. Stresau, Wauwatosa, Wis. App. filed Nov. 24, 1924.

1,643,238. INDICATOR; R. E. Curtis, Benton Harbor, Mich. App. filed Jan. 29, 1926. For use upon storage batteries for indicating the level of fluid within any cell of the battery when the level has fallen to a point where its further lowering would be detrimental to the cells.

1,643,254. WELD ROD AND PROCESS OF ARC WELDING WITH THE SAME; J. C. Miller, Milwaukee, Wis. App. filed May 12, 1924.

1,643,270. MAGNETO-ELECTRIC AUTOMATIC INTERRUPTER; M. Greiner, Charlottenburg, Germany. App. filed May 17, 1926. Buzzer.

1,643,274. WELD ROD FOR ARC WELDING; C. B. Langstroth and G. G. Wunder, Milwaukee, Wis. App. filed May 23, 1923.

(Issued Sept. 27, 1927)

1,643,291. APPARATUS FOR THE PRODUCTION OF WELDED WIRE FABRIC; A. Armstrong, Whitley Bay, England. App. filed Nov. 18, 1924.

1,643,292. MOTOR CONTROLLER; D. H. Chason, Elizabeth, N. J. App. filed Nov. 19, 1924. For sewing-machine motors.

1,643,306. RAIL BOND; F. C. Lavarack, Montclair, N. J. App. filed Jan. 15, 1923.

1,643,307. METHOD AND APPARATUS FOR WELDING; J. F. Lawson, Brooklyn, N. Y. App. filed May 16, 1924. For continuous butt welding as in forming metal tubes.

1,643,327. ALTERNATING-CURRENT MOTOR; H. Weichsel, St. Louis, Mo. App. filed Nov. 2, 1925. Multipolar compensated synchronous and asynchronous alternating-current motors; means for maintaining substantial equality between voltages appearing at brushes of like polarity and therefore avoiding cross-currents between such brushes.

1,643,340. ELECTRICAL RELAY; H. O. Holte, Wilkinsburg, Pa. App. filed April 18, 1925. Means for selectively operating the contacts.

1,643,398. SYNCHRONOUS MOTOR; H. Weichsel, St. Louis, Mo. App. filed Dec. 31, 1923. Separately excited synchronous motors. Means whereby the direct-current excitation will increase, with increasing load, in accordance with the degree of angular displacement between the axis of the inducing field and the axis of the direct-current magnetization through the rotor.

1,643,405. POLYPHASE HIGH-FREQUENCY-CURRENT GENERATOR; R. D. Duncan, Jr., East Orange, N. J. App. filed Oct. 27, 1925.

1,643,411. HAIR-CURLING APPARATUS; P. Kunin and R. A. Olsen, Minneapolis, Minn. App. filed Jan. 18, 1926.

1,643,415. AUTOMATIC CIRCUIT BREAKER; E. D. Moore, Cleveland, Ohio. App. filed Sept. 14, 1923. Built in the form of a plug fuse.

1,643,444. MULTIPLE ELECTRIC SWITCH CASING; G. A. Burnham, Saugus, Mass. App. filed Aug. 16, 1921. For oil-immersed switches.

1,643,462. TERMINAL PLUG AND SHEATH FOR ELECTRIC CABLES; H. Kocourek, Chicago, Ill. App. filed Oct. 22, 1926.

1,643,486. DRY CELL; F. H. Cirves, Madison, Wis. App. filed May 28, 1927.

1,643,513. BINDING POST; F. E. O'Brien and L. Freeman, Northampton, Mass. App. filed March 25, 1925.

1,643,550. ENGINE CONTROLLER FOR WELDING SYSTEMS; R. E. Frickey, San Francisco, Cal. App. filed Dec. 26, 1925.

1,643,565. HIGH-TENSION INSULATOR; A. Simon, Munich, Germany. App. filed July 10, 1925.

1,643,575. HEAT-CONTROLLING DEVICE; W. F. Clark, Cleveland, Ohio. App. filed July 14, 1921. To make or break an electric current upon predetermined temperature variations.

1,643,582. TEMPERATURE-RESPONSIVE APPARATUS; C. A. Martin, Chicago, Ill. App. filed Jan. 8, 1924. A plurality of serially connected thermo-couples in combination with a balancing circuit, such as a potentiometer, whose deflecting instrument, such as a galvanometer or equivalent, controls the mechanism of a recorder, control apparatus or equivalent.

1,643,599. SWITCH PLATE; F. H. Auld, Columbus, Ohio. App. filed Oct. 12, 1925.

New Trade Literature

LIFTING MAGNETS, RESISTORS, CONTROLLERS AND BRAKES.—Bulletins Nos. 900, 940, 980 and 1004 issued by the Electric Controller & Manufacturing Company, Cleveland, describe and illustrate respectively the "E.C.&M." type "SA" magnets, "E.C.&M." type "H" nickel-alloy resistors, "E.C.&M." type "G" controllers for direct-current motors and the "E.C.&M." type "WB" brakes. Price sheets applying to various bulletins are included.

SWITCHES AND CONTROLLERS.—Bulletins GEA-813, GEA-821 and GEA-826 issued by the General Electric Company, Schenectady, N. Y., describe and illustrate the CR7009-W3 and W4 magnetic reversing switches for alternating current, the CR2927 pressure and vacuum switches for alternating and direct-current circuit and the CR4771 and CR4772 duplex controllers for direct-current motors driving pumps.

AUTOMATIC TIME SWITCH AND LAMP LIGHTER.—The Robbins & Myers Company, Springfield, Ohio, is distributing bulletin No. 1344, covering its "lamplighter," an automatic time switch.

MOTORS.—Bulletins GEA-98, GEA-712, GEA-808, GEA-787, GEA-6A, GEA-246A and GEA-760 issued by the General Electric Company, Schenectady, N. Y., describe and illustrate its adjustable varying-speed alternating-current motors, adjustable-speed alternating-current brush-shifting motors, totally inclosed induction motor "500 series," vertical "500 series" induction motors, type "KT" squirrel-cage motors, "500 series," the G-E general-purpose synchronous motors and improved brush holders and ventilating covers for GE-275 railway motors.

TRANSFORMERS.—The Sorgel Electric Company, 91 West Water Street, Milwaukee, has issued bulletin No. 1027, describing its air-cooled transformers, auto-transformers, insulating transformers and special transformers.

MOTORS.—Bulletin GEA-788 issued by the General Electric Company, Schenectady, N. Y., describes and illustrates its type "FT" three-phase and type "FQ" two-phase normal starting torque, for full-voltage-starting general-purpose squirrel-cage motors.

DRY-QUENCHING OF COKE.—The Dry Quenching Equipment Corporation, a subsidiary of the International Combustion Engineering Corporation, 200 Madison Avenue, New York City, has issued bulletin S-1, describing the Sulzer system for the dry quenching of coke.

ELECTRIC CONTROL APPARATUS.—The Sundh Electric Company, Inc., 5 Avenue C, Newark, N. J., has issued a complete series of all its bulletins describing its electric control apparatus. Each bulletin contains illustrations and complete information, including line drawings, dimension data and other engineering information.

BATTERY-CHARGING EQUIPMENT.—The General Electric Company, Schenectady, N. Y., is distributing bulletin GEA-817, covering its battery-charging equipment.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase and agency are desired in Milan, Italy (No. 27,596), for bakelite insulating material in blocks and sticks.

An agency is desired in Johannesburg, South Africa (No. 27,648), for electric burglar-proof device.

Purchase or agency is desired in Riga, (Latvia (No. 27,593), for household electric appliances.

Purchase and agency are desired in Melbourne, Australia (No. 27,595), for single inclosed and semi-indirect lighting fixtures.

Purchase is desired in Pretoria, South Africa (No. 27,594), of electric stoves.

Business Facts for Electrical Men

Selected Statistics Presented Graphically for the Use of All Interested in Analyzing the Trend of the Electrical Business

More People Taking Service or People Taking More Service?

HOW many unwired homes are there within reach of electric service company lines? What are the prospects for future increase in the number of residential customers? These questions are repeatedly being asked. A precise answer is impossible; too many uncertain factors are involved, but an indication of the trend may be had from a study of past developments.

The number of persons within reach of electric power circuits is, at best, a somewhat vague quantity. Where shall we draw the line? Practice in this regard probably differs among the various utility companies. Any figures given are necessarily estimated.

Also, there is evidence that the number of residential customers is actually not limited to the number of families as determined by the census, even after allowance has been made for growth since 1920. This is already true in some localities, notably the whole State of California, and is likely to happen elsewhere. Whatever the explanation, the fact remains.

But even if the number of customers is not absolutely restricted to the number of families reached, a comparison of the two certainly serves as an indication of the prospects for new business.

A summary of statistics from various sources makes it evident that the past twenty years have witnessed a remarkable change in the degree to which electric service has been extended to potential customers within reach of power circuits.

In 1907 the number of residential central-station customers was less than one-tenth the total number of families living in the United States and less than one-sixth of those within reach of their circuits. In 1917 the residential customers equaled a fourth of all families and constituted 40 per cent of all in the territory served. Over 17,000,000 families were still without electric service.

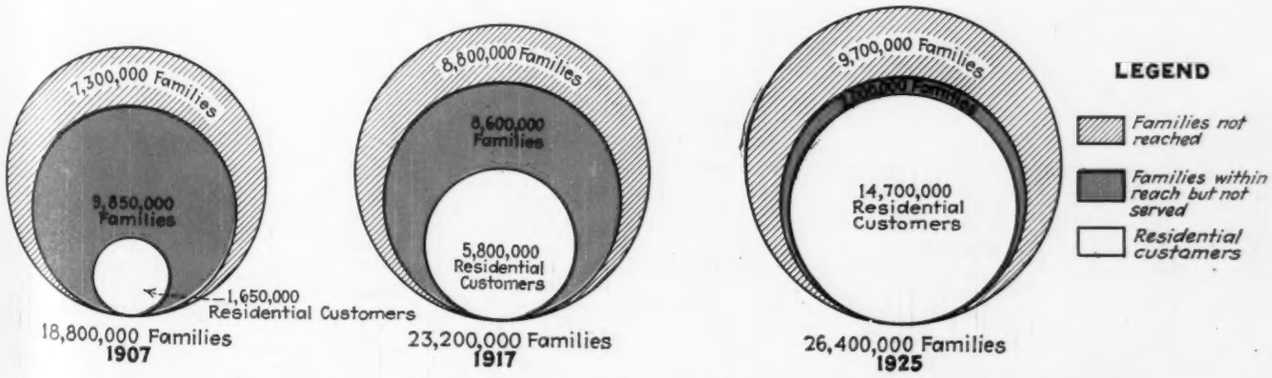
By the end of 1925 the situation had entirely changed. Residential customers numbered 14,700,000; there were now 26,400,000 families in the country; the estimated number of those within reach but not served had fallen to 2,000,000 families.

Admitting that these 2,000,000 do not represent all the increase in sight—the 1927 figures are steadily mounting and there is no evidence of an abrupt change—it seems clear that the pace must slacken. The very large additions of a few years ago have not been duplicated and will scarcely be repeated.

What then? There is no danger that the growth of electrical energy sales for service in the home will be retarded for many years to come, as compared with its present rate.

But it will not be maintained primarily by increasing the number of consumers; it will be done by increasing the consumption per customer. Electricity had first to find its way into the home as the preferred source of light; next, to show its possibilities for better and more decorative illumination; the use of appliances comes later. The first has been measurably achieved. The others are still big with promise. More people using electric service—yes, so far as possible; but also—people using more electric service.

Most of the data for statistics in the ELECTRICAL WORLD are gathered by it from original sources. Privilege is freely given to readers of the ELECTRICAL WORLD to quote or use these statistics for any legitimate purpose. While there is no requirement that the source of data be given, yet it would help the ELECTRICAL WORLD in obtaining and compiling further basic information if those who make use of these statistics would give credit to the ELECTRICAL WORLD.



Residential Customers, Families in Territories Served, and Total Families

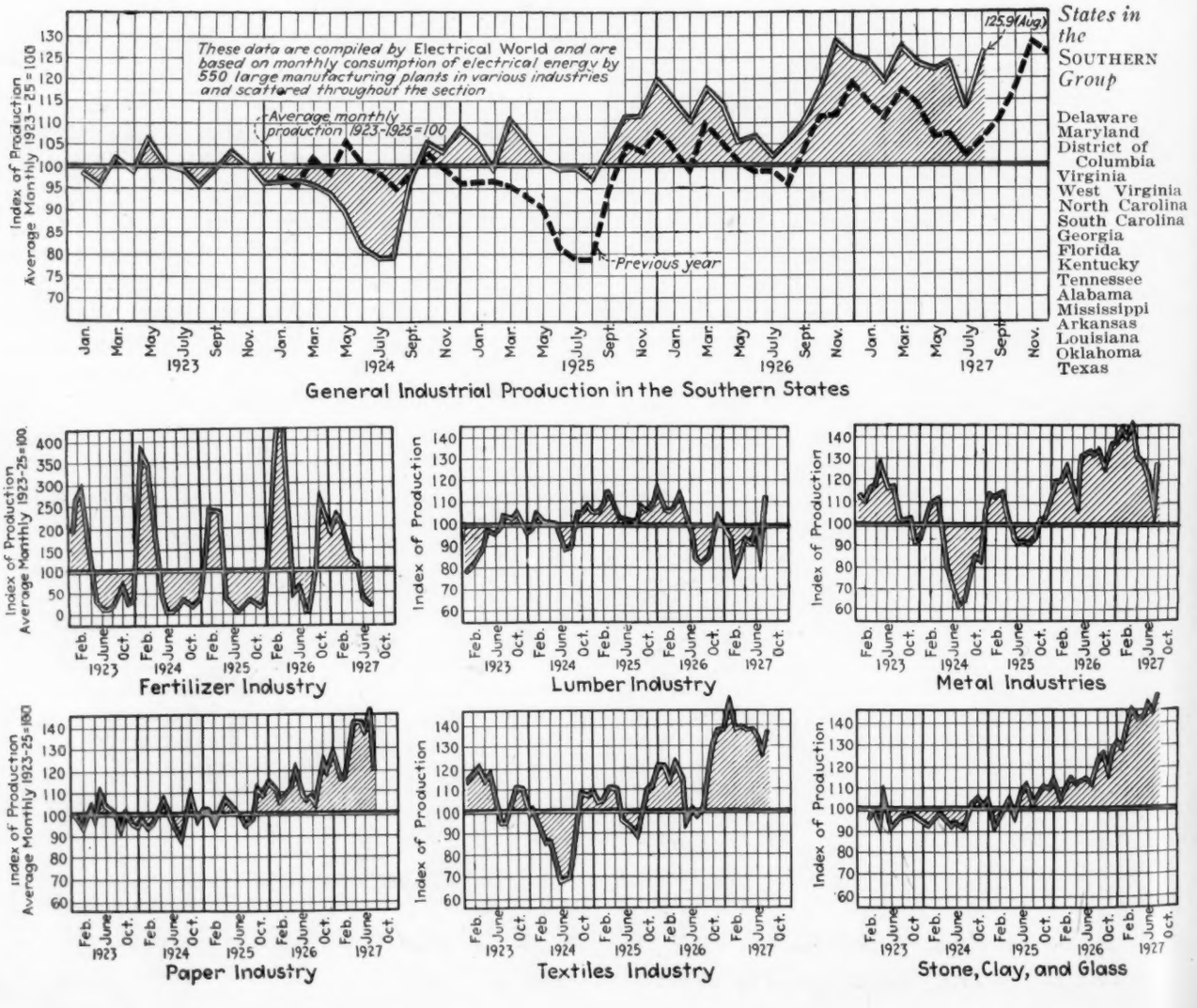
Southern States Report Record Growth in Industrial Production

IN LINE with production operations witnessed at this season during years past in the manufacturing plants of the Southern States, the month of August recorded materially increased operations over those reported for July, the productive activity increasing by 13.7 per cent during the month. The rate of productive activity in this section during the current August was also about 14.7 per cent over August, 1926, the greatest twelve-month growth recorded in this section in recent years. Such is the picture of general industrial activity in the Southern States as indicated by reports of monthly electrical energy consumption that have been received by the ELECTRICAL WORLD from about 550 large manufacturing plants in various industries and scattered throughout the section.

The manufacturing plants in the Southern States have been reporting operations above the year previous ever since the fall of 1924. The growth in operations during the present year, however, has exceeded that reported in 1925 and in 1926, and it now seems probable that the volume of production by the industries of this section during the present year will exceed that of 1926 by about 12 per cent, an annual growth far exceeding that being recorded in any other section of the nation. In the nation as a whole the industrial activity during August was slightly below that of August last year, and there seems to be a large possibility that productive activity in the nation as a whole will continue under that of the same month last year for some months to come. The favorable conditions reported in the Southern States, therefore, are very different from those being witnessed in the country as a whole.

This increased rate of general production in the Southern States during the past year has been due to the materially increased productive activities recorded by the textile plants, the metal industries, and the stone, clay and glass industry. The productive operations of the textile plants of the section during August were about 0.4 per cent over those of July, after corrections are made for the number of working days in the two months. The August rate of activity in this industry was also about 30.5 per cent over that of August last year. The August rate of operations was only about 1.5 per cent under that reported for March, a remarkably low seasonal drop in operations.

The metal industries, which include both ferrous and non-ferrous working plants, materially increased their rate of production in August over July, but were operating on a plane about 5.8 per cent under that of August, 1926. This is the only one of the leading industries of the section recording an activity under that of last year. This condition in the metals group is in agreement with reports of national operations in the same group of industries.

ELECTRICAL WORLD *Barometer of Industrial Activity in the Southern States*

(Data Unadjusted for Seasonal Variation)